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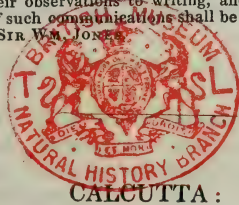
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JOURNAL
OF THE
ASIATIC SOCIETY
OF
BENGAL.

EDITED
BY THE SECRETARY.

VOL. X.
PART II. JULY TO DECEMBER, 1841.
NEW SERIES.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia* will commit their observations to writing, and send them to the Asiatic Society in Calcutta; it will languish, if such communications shall be long intermitted; and will die away, if they shall entirely cease."—SIR W. JONES.



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JOURNAL

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ASIATIC SOCIETY.

On the Natural Products about the Pundeelah River, H. H. the Nizam's territory.—By DR. WALKER, Madras Army.

I marched from Pakhall on the 7th instant in a North-westerly direction towards Madhapore, which I reached on the 13th. I remained there for five days, when I proceeded to this place, deviating from the direct route by going ten miles up the Pundeelah river.

At Dogundah, the first stage on the march from Pakhall, so deep was the soil, that I experienced considerable difficulty in procuring a specimen of the surface rock. Upon obtaining one, I found it to consist of sienitic granite, with a considerable quantity of mica interspersed. One of those greenstone veins so commonly met with, was found traversing the rock in the usual direction from East to West to near the next stage, Korapack. Here, in some places of the plain, the granite was observed to lose its hornblende and mica altogether, and become the pegmatite of French writers. The great proneness of the felspar to decompose in this form of granite, is shewn by the brackish water of the neighbourhood; and here it may be remarked that, within the tropics, where from the great heat and other causes, there is a continual tendency to decomposition and recomposition, it necessarily appears that wells sunk in rocks containing alkali, particularly if lime is present in the soil, must ever contain water more or less impure, and that the impurity will always be found in a direct ratio to the facility with which the rock disintegrates. It must also follow as a consequence, that the older the well

is, the worse the water; for the salts that occasion the brackishness are by no means removed on their contents being drawn out, or evaporated; but adhere to the sides of the well, or being extremely soluble, as they all are, impregnate the bottom mud to some depth. May not the proverbial unhealthiness of old deserted cities be in a great measure attributable to the water reservoirs being all in the same state?

At the next stage, Gunpoora, the elevations to the right were ascertained to be of the sandstone formation, similar to that of Pakhall. The granite continued for some miles to be the surface rock; but it finally disappeared at Chintakaminah, the stage next to Madhapore, where its place was taken by the sandstone.

Between Senapore and Madhapore, the country, particularly after entering the Chinnore Sircar at Chumblepore, is exceedingly jungly. The wood jungle, which commences at the last mentioned place, consists of the trees formerly noticed in the description of Pakhall, with the addition of two or three *Gardenias*. Two species of *Bignoria*, the *crispa* and *quadulocularis*, the *Schrebera Swietenoides*, a species of *Cordia*, the *Strychnos Potatorum*, the *Randea dumetorum*, the *Terminalia Chebula*, two species of *Casearia* and *Celastrus raniculata*; the last a climbing shrub. Of the grains and legumes cultivated in this Sircar, there is little or no difference between them and those of Humunkondah, mentioned in my first letter. The *Linum usitatissimum* is grown here in small quantity, but a good deal is imported from Chandah. Its oil is chiefly used by the sawyers.

A species of *Capsicum*, known in Western India by the name of Nepal chilly, is grown here. Cotton is also raised, but in very small quantity. The Goands who inhabit the hills and fastnesses of the north, use the bamboo seeds, ground to a meal, and mixed with milk, as an article of diet. Cattle, buffaloes included, present nothing remarkable. The latter, as elsewhere in other parts of India, are used for draught.

There are flocks of sheep, with the brown wool, here; it is not esteemed of much value, and is chiefly sent to Chandah in the Nagpore territory. The Goands bring in hides of the Samber* and Nilgye† for sale; the price is from eight annas to twelve annas each.

* Samber or Samur. The Indian Elk.

† Nilghye.

The principal manufacture throughout this district is the tusser or jungle silk. The tusser *breeders* are a class quite distinct from the weavers, and are either Telongoos of low caste or Goands; the former reside principally at Chilpore, Madapore, and Chinnore. At Madapore, which may be regarded as the centre and head quarters of the tusser-breeders, there are at least seventy families.

The tusser-breeder never thinks of keeping up the breed of the insect throughout the year. When the leaf is off the tree, about the middle of March, he deems his occupation gone, and he leaves the object of his former excessive care to shift for itself, thinking of nothing but his present ease, which may be summed up in a few words, —sloth, a bare subsistence, and an occasional debauch in his nectar, *palm toddy*. But with the rains returns his toil, and some little difficulty is experienced in procuring insects for a fresh campaign. If he can gather a dozen of promising cocoons, which his experience tells him are of females, he is quite satisfied. Carefully does he watch the bursting of the cocoon, and much care does he take of its winged inmate, having previously prepared for it a house of teak leaves dried. The male is not tardy in approaching.

Impregnation takes place, the male dies, and in four days after laying her eggs, the female also. The eggs are in number about sixty, of these one-half prove abortive, while the others are hatched in ten days. The small insect is fed on the tender leaves of the *Careya sphærica*, and in six weeks spins its cocoon; the first brood are spared and allowed to burst their cocoons to supply a sufficient quantity of ova for the first tusser harvest; the same process as described is again gone through, with this exception, that the young worms are this time fed on the leaves of the *pentaptera tomentosa*, as those of the *Careya sphærica* are, by the period of the season, supposed to have acquired some influence noxious to the insect. It is during the progress of the worm, from the egg to the formation of the cocoon, that every energy of the tusser-breeder is called into action for the preservation of his charge. Every animal, footed, winged, and creeping, is said to be the enemy of the tusser grub. Ants destroy them, kites and crows prey on them, snakes devour them, and squirrels are said to make a repast of them. To protect them first from their insect enemies, the tusser-breeder ascends the Muddy tree, (*Pentaptera tomentosa*,) the

leaves of which are the insect's food ; every branch he carefully clears of the different species of ants by which they may be infested, preventing the access of others, by surrounding the trunk of the tree at its foot with ashes. The other enemies are kept off by shouting, throwing stones, firing guns, &c. Their life at this time would appear, by their own account, to be one of the most unremitting toil ; to devote themselves to which they forswear not only every indulgence, but every comfort ; and it rouses the apathetic peasant of *Telengana* to eloquence, when he recounts what privations he undergoes, what pleasure he derives himself, and what incessant labour he incurs while watching the rearing of the worm, and the perfecting of its work. The tusser butterfly is a species of *Saturnia*, probably the *aphia* described by Dr. Helfer as the most common of the native species. I send a specimen of a female moth.*

From four to five hundred of the cocoons are sold to the *Bunnyas* and weavers for one rupee ; the moth is killed by means of heat. There are three tusser harvests, one at the end of the rains, the other two in the cold season. The winding of the silk is accomplished by boiling the cocoons, separating the floss of which no use is made, and twisting eight or ten filatures from as many cocoons on the middle of the thigh with the left hand to be wound on the instrument, of which a muster is sent : this instrument the middle bar of the wood is held lightly in the hand of the workman and made to move in a semicircle. An ounce and a quarter of silk is the average daily winding of a single workman ; his wages are, at the common rate of one pice for winding the silk of fifty cocoons, about three pice a day, as he cannot wind more silk than from a hundred and fifty cocoons. The pice, however, are large, and go there by eight to the rupee.† The only dyes used for the tusser silk, as far at least as my observation or inquiry has gone, are the flowers of the palas and turmeric ; by the former the usual familiar colour is produced, by the latter a golden yellow is brought out after the threads are for some time immersed in a solution of ashes. The warp threads are stiffened with rice congee.

WAX.—A good deal of honeycomb is brought into Madhapore and Chinnore by the hill people. It is quite impossible, under the present

* This has not reached us, but it would be very curious to know, if that of Assam, described by Dr. Helfer and Mr. Hugon is the same as this of Hunumkonda. ED.

† So in MSS.

circumstances of limited demand, to say what further supply these jungles might afford. The honey is sold for ten seers the rupee, and sent to Hyderabad. After the rains, and during the cold season, six or seven seers of wax can be purchased for a rupee.

It may here be mentioned, that the seer of both this and the Sircar of Hunumkondah, consists of fourteen thousand two hundred and twenty-seven grains, that is, about half an ounce more than two pounds. The maund is equal to twelve seers.

LAC.—The jungles in the Sircar, by report, yield this substance in abundance ; but the little demand comparatively speaking, induces few traders to encourage the hill people to bring it in. It is thus impossible to say what the actual supply of Lac really might be without traversing the jungles at the proper season ; but there can be little doubt that it would be ample. A specimen of it is sent.

GUMS.—East India Gum has obtained the bad fame of almost every East Indian production not under the direct superintendence of Europeans. It is called a spurious inferior article ;—the cause is obvious—the collectors mingle all sorts together, and there being no one to select from the chaos they bring in, to check the admixture of good and bad, or to fix a value on the article, they go in this state to the European market with the brand of East Indian. They are soon found, like all mixtures, to be inferior, and the original prejudice acquires at once the stamp of currency, the cause of their inferiority being wholly overlooked. The value of gum depends on its whiteness and solubility. Who has ever separately tested the solubility of the Gums now sent ? at least three of them are not even mentioned in botanical works ?

Gum 1.—*Conacarpus latifolia*. This is used by the tusser weaver.

Gum 2.—*Terminalia tomentosa*.

Gum 3.—*Terminalia bellerica*.

Gum 4.—*Buchanania latifolia*.

Gum 5.—*Garuga pinnata*.

Gum 6.—*Cochlospermum gossypium*.

Gum 7.—*Sterculia urens*.

The two last are nearly similar in their properties to gum tragacanth, and the gum of the *Sterculia urens* was actually used for some time as a true *Astragalus* gum ; there can be little doubt but that both are still constantly substituted for it.

It is difficult to say with any exactness, at what price these gums might be procured from the collectors, as the *Bunnys* are very partial to the truck system, and rarely pay in money if they can avoid it; a state of things almost natural in a country like this where money is scarce.

GUM RESIN.—Frankincense of the *Boswellia thurifera*, the olibanum of the ancients. Of this a specimen is sent. The tree is very common in the jungles.

RESINS Decamully.—This substance, formerly accounted a gum, has been fully proved to be a resin. It is the produce of three species of *Gardenia*, all exceedingly common.

I am not aware that this article is yet employed for any economical purpose, but it is a substance that certainly deserves the notice of the artisan. It is very much used in native medicine.

OILS.—Both varieties of the sesamum plant, black and white, are cultivated, and from the seeds of the *Bassia latifolia* and *Balbergia latifolia*, oils are expressed and used for common purposes. Two varieties of the castor-oil are cultivated. I made a trial of the quantity of oil that the kernel of the nuts of the *Buchanania latifolia*, (*Chirongy*,) would yield, and obtained an English pint from two seers of seed.

This is an oil seldom or ever used by the natives. If it possesses the drying quality of nut oils in general, it may become a valuable article of commerce. The kernels of the *Chirongy* nuts are purchased at Madhapore, from six to eight seers the rupee.

The oil-press by which the oil was obtained, was of the simplest construction. It consisted of two logs of teak, with a hole in the extremity of each, through which passed a stake fixed in the ground, the other two ends were left free, and rested on the bifurcation of a strong piece of timber shaped like the letter Y. This was also fixed in the ground; the kernels were placed in a small bag formed of the liber of the *Sterculia urens*; they contained about half a pound, and were set one above another at the middle of the lower beam, pressure was then made by means of rope tied round the free extremities; this was done four or five times, the position of the bags being altered each time. The whole apparatus did not cost half a rupee; by it the *Mowah* oil is always expressed in this part of the country. The oil mill is used for most of the cultivated oil seeds, and castor-oil is obtained in the usual mode, by pounding and boiling.

ARTICLES OF THE MATERIA MEDICA.

Justicia Paniculata (CREYAT).—This drug, which forms the active ingredient of the celebrated French nostrum *Droque-amere*, grows in great abundance here. It is an excellent bitter and febrifuge.

STRYCHNOS POTATORUM.—This tree is found in the jungles; the peculiar property possessed by its seeds of rendering turbid water clear, might perhaps be turned to some account in the arts. It possibly depends on Bassorine, known to be an ingredient in the seed of more than one of its congeners. The *Nux vomica* tree is very common, as is also the *Celastris paniculata*, the seeds of which yield the celebrated black oil, (*Oleum nigrum*,) of Dr. Herklots. Two or three mucilaginous roots were shown me; one of these was that of *Asparagus acerosus*, another was most probably the root of the *Curculigo orchidoes*. The *Asclepias procera* was, as usual, very common, likewise the *Asclepias pseudosarsa*, country Sarsaparilla. The tuberous roots of two wild species of *Dioscorea* were brought; one of these, *Dioscorea oppositifolia*, has been found to yield a good arrow-root.

DYES.—The *Oldenlandia Umbelata* (Cherwil) grows wild here, as well as in the Hunumkondah Sircar. The bark of the *Morinda exerta*, which grows in the jungle, is also employed to dye red. A suggestion lately made by Mr. Solly of London, of making extracts of dye woods and barks, would be applicable to a bulky material like the present. The *Crotum plicatum* grows in great luxuriance on the alluvial soil on the banks of the rivers.

TIMBER.—Madhapore is the great depôt for timber, chiefly teak, that is floated down by the rivers from the Nagpore country. Ebony trees are found in the jungle to the south of this. The *Schrebera Swietenoides*, the wood of which is said not to warp, grows to be a fine tree, and is abundant. All the valuable timber trees mentioned in my last letter, are to be met with.

CORDAGE.—The common Sunn plant, the *Crotolaria juncea*, is cultivated, and its fibres are made use of for many purposes as hemp. The fibres of the inner bark of two species of *Bauhinia* are twisted and used as rope, particularly by the Brinjarries; the inner bark of the *Butea superba* is also employed for the same purpose. I send a specimen of the rope made from the last.

The *Asclepias Tenacissima* of Roxburgh is found here. It is well known to yield very strong fibres, the strongest indeed of any plant

known. The fishermen in the rains collect it, beat out the fibres, and twist them for their nets. I shall endeavour, although the plant is out of season, to procure a specimen of this hemp, which I shall forward; and I have left directions at Chinnore, that a parcel be sent to Hyderabad, towards the end of the rains; at which time the plant is gathered, that a comparison be instituted between its strength and that of the various hems, whether the produce of this country or of Europe. It is also said to yield a species of caoutchouc. I propose starting from Chinnore *en route* to Cummurret this evening.

Note on Timber.

Although valuable teak is not the produce of this part of the Nizam's dominions, (for the greater part growing here is adapted solely for props and rafters,) yet as Madhapore is the great depôt from which the wood is sent to Hyderabad, &c. a brief notice respecting it may not be deemed out of place. The teak (*Tectona grandis*) grows to a large size in the country to the north of Chinnore, about eighty miles distant; chiefly in the territory of the Raja of Nagpore, along the banks of the streams tributary to the Pundeelah. Other valuable timber, particularly the *Diospyrus melanoxylon*, yielding black ebony, and another species of *Diospyrus* yielding green, a *Dalbergia* called by the natives *shesum*; but which may not, however, be the real sissoo, but rather its near ally the *Dalbergia latifolia*, for from such observers accuracy the distinguishing species is not to be expected—all these different woods were floated down some years ago by the house of W. Palmer and Co., but at the present time teak, and a very small quantity of shesum, are the only kinds cut. I have merely native report as to the extent of the forests yielding these woods, but they are described as of great extent. During the dry months the teak-trees are felled—they are conveyed sometimes on carts, but more frequently by bullocks yoked to them to Eeroo, or Agree, a village fifty miles up the Pundeelah from its junction with the Godavery. Nullahs in the rains are also taken advantage of for the same purpose. It is well known, that the natives prefer the period when the moon is on the wane for cutting timber, assigning as a reason, its liability to be attacked by insects when cut at the period of the moon's increase. When we acknowledge, as is now usually done, lunar influence

on the animal kingdom, we must be slow to deny its power on the less perfectly organized vegetable, and hence we must regard this practice as not the mere result of ignorance or prejudice; but must class it in the catalogue of facts to be investigated. With teak, however, it is remarkable that no period of the moon is observed, being cut without reference to any such time, as they allege that the oil contained in it, is protection sufficient against the common casualties to which other timber is subject.

At Teroo, the teak is barked, squared, and dried. From the beginning of the rains until February it is floated down in rafts, and landed principally at Madhapore, although still a certain quantity passes on to Rajamundry and Masulipatam. The raft consists of three tiers of wood placed across each other, and firmly bound together with ropes of the liber of the *Bauhinia parviflora* and *Butea superba*. They are conducted by persons of the bearer caste, and usually take six or eight days to reach their destination to Madhapore from Eeroo, although sometimes the voyage is accomplished in a couple of days. The timbers are there classed according to their size:—

1st.—The Mowhoont, twenty-four to thirty feet in a length, with breadth and depth of eighteen inches. A log like this requires a bandy (hackery) with from six to eight bullocks for its conveyance.

2nd.—Doolkahoot. This also is a large timber; but shorter than the preceding, and not so thick.

3rd.—Danpet. Common wood for beams and deals.

4th.—Sarmundum. A smaller timber than the last, used for the same purposes.

All other kinds are classed under *Dunta* for the larger, and *Kurry* for the smaller. The carts for conveying the wood are strong and well built; their axle trees are of the wood of the *Conocarpus latifolia*, and the wheels solid and without spokes of the *Pentaptera tomentosa*. Considering the variety of soils they have to traverse before reaching their destination, they are well adapted for their object; they take fifty days to reach Hyderabad, and it was stated to me, on what I consider tolerable authority, that the price for conveying sixty square feet of teak from Madhapore to Hyderabad, was not much under five rupees! From eight hundred to a thousand carts are annually despatched with teak from Madhapore: the Brinjarries convey the smaller kinds.

Report on the River Indus, (Sections 1 to 5.) By Lieut.
WOOD, Bombay Marine.

I.—*A General View of the Indus.*

This report is confined to the navigable Indus, or that portion of the river lying between the Sea and Attock.

Throughout the whole of this distance, the river is known as the Sinde, sometimes indeed it is called the Attock, but this latter designation is local in its application. I have retained both, and apportioned them as follows :—

The Lower Sinde, or Indus, extends from the Sea to Bukkur.

Upper Sinde, or Indus, extends from Bukkur to Kalabagh.

Attock from Kalabagh to Attock.

By dividing the river into these sections, each is made to mark certain important alterations in the navigable character of the stream.

It may here be premised, that of the course of the river North of Attock, our knowledge is confessedly superficial. A few miles above that fortress the Indus ceases to be navigable ; but not before it has received in the Cabool river a tributary, that further extends the advantage of water carriage to the West,—the most important of all directions.

Source.—To what Lieutenants Burns and Macartney have written on the subject I have nothing to add, unless Moorcroft's travels settle the question. The source of the Indus is still a problem to be solved.

In the plain above Attock, the Indus is divided into many branches, but abreast of that fort they all unite. One deep, narrow, clear, blue stream, shoots rapidly past, and at once entering the hills, disappears from sight. Among hilly groups it winds to Kalabagh. At Mukkud the channel widens, and the expanded river flows quietly forwards with a lessened velocity, and a reduced depth. On escaping from its rocky bed the river enters a level country, through which it winds onward to the sea. Its boundaries are now those of the valley ; the Soliman mountains are on one side, and the Indian desert on the other.

Length of Course.—From the Sea to Attock, the distance in a straight line is 648 miles.

By the River it is increased to 942 miles.

Breadth of the Stream.—The width of the surface water in the dry season, varies from 480 to 1600 yards; the usual width is about 680 yards.

Depth.—When the river is in full freshes twenty-four feet; but in an opposite season of the year, nine, twelve, thirteen, and fifteen feet are the usual maxima of its soundings. The greatest depth of water in the Indus occurs between Kalabagh and Attock; one hundred and eighty-six feet has been here sounded.

Velocity.—Seven knots an hour in the freshes, and three when the river is low. It is scarcely necessary to remark, that the three last items are very inconstant. At no two places are the measurements exactly alike, nor do they continue the same at one place for a single week. A more particular account of these will be found under the next head.

Fall per mile.—From Attock to Kalabagh, 20 inches.

Ditto Kalabagh to Mittun, 8 ditto.

Ditto Mittun to Sea,* 6 ditto.

Discharge per second.—Cubic feet Maximum—

in August, 446,080

Maximum in December, 40.857

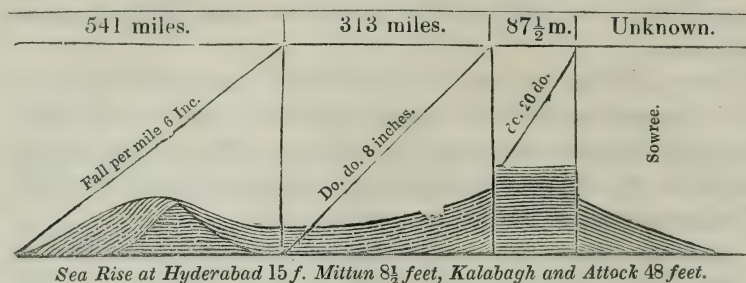
Annual Discharge.—5,383,600,934,400—or 150,212,079,642 tons avoirdupois.

Power of Transport.—Rolled pebbles do not occur in the bed of the Indus below Chandia-ke-kote, a village five miles South of Kalabagh. Above Kote, though not below it, the sand of the Indus is searched for gold. The precious mineral is also found at Dera Ismail Khan; but not in the river.

It is washed down by the rains from the Soliman mountains. Pebbles also occur at a certain spot in the river below Hyderabad, in Lower Sind; but they can be traced to hills in the neighbourhood.

Height of the River's Banks.—Assuming for the purpose of explanation that the source and the embouchure of the Indus are upon the same level, the river in its long course may be said to have two maxima of rise. These are shewn in the following sketch, where the measurements are those of the stream when in full flood.

* The fall of the river from Mittun to the Sea is from Captain Burnes' Memoir of the Indus.

Distance by the River.

The rise between Kalabagh and Attock cannot be called natural ; it is caused by the contracted bed, into which the stream is here thrown among the mountains. The rise at Hyderabad is the result of a carefully kept register daily ; but at the other places, this item has been reduced from an examination of the river's banks, and the best information I could procure.

Colour and Temperature.—To Dera Ismail Khan, the water of the Indus is of a lead colour ; below that town it becomes of a dirty whitish yellow, tinged with red. In the freshes the red tint is heightened ; but the general colour continues the same.

Between Attock and Mittun, all the streamlets that fall into the Indus are of a bright red ; save the Hurroo and Toe, which have pebbly beds and clear water.

Temperature of the River.

Months.	Air.	River.	Remarks.
February,	69° 2'	64° 2'	Noon observations in the parallel of 24° 0' North.
March,	90° 0'	78° 0'	
April,	97° 0'	81° 0'	
May,	100° 0'	84° 0'	
June,	101° 0'	87° 0'	
July,	95° 5'	88° 0'	
August,	95° 7'	88° 0'	
September,	94° 5'	86° 0'	

II.—Navigable character of the Indus.

Between the Sea and Attock the facilities for navigation are not everywhere equally great. They vary with the state of the river's bed. As an acquaintance with the one may contribute to a know-

ledge of the other, I shall apportion the river into sections corresponding to its capabilities, and afterwards indicate the character of the present method of navigating the stream.

The Delta.—As high as the influence of the tide extends, there will always be an ample depth of water for even vessels of a greater draft than those elsewhere described as the best and only boats suited to the river under all circumstances.

It reaches to Nooroo-kanand, a village on the left bank of the river below Tatta. But above this navigation is intricate, nor does it materially improve till beyond the *Delta*.

This is owing to the great expansion of the river's bed, where among the numerous channels that present themselves, it is not always an easy matter to select the right one. No great inconvenience is felt on this score by the vessels now upon the river, for whether they ascend it laden, or in ballast, dragged by the track rope, or propelled by the breeze, their progress is so slow that they may be said to feel every inch of the way.*

From the Delta to Sehewan.—This is the best portion of the river, and the *Pulla* fisherman as he floats down the centre of the stream, proclaims the fact. The pole to the lower extremity of which his net is fastened, measures from sixteen to twenty-two feet, and according as this may be in March or August, either eight or fifteen feet of its entire length is immersed in water. Two rocky ledges occur in this section; both project from the right bank of this river, and are found, one under the village of Jeskh, and the other at the north end of the Hilaya reach. Both are under water in the swell.

Sehewan to Roree, or Bukkur.—As the character of the last section was determined by the avocations of the fisherman, so may be that of this one. The fishing pole is no longer in general use; but among the shallows in the middle of the stream, men armed with creels, shaped like inverted cones, may be seen busy at work ensnaring the *pulla* fish. Here then it may be presumed, the depths are too irregular for the employment of the former method. Such is the cause, and thus does the practice of the fisheries on this river become an index to the state of its navigation.

Bukkur to Mittun.—A great change here takes place in the character of the river. The stream at Roree, though at some places it may

* See Appendix, Table V. for the soundings of this and other sectional divisions.

be found in a single bed, is more often divided into two or more parallel branches, from 400 yards to four miles apart. Where the former is the case, (at Mittun-kote and for some distance below it, for example,) the channels are more mazy and intricate than where its volume, as in the latter instance, is apportioned among a number of branches. These changes in the configuration of the river are met by a corresponding alteration in the build of the boats. A new description of vessel, called a *tohruk*, of a less draft than the *doondah*, is now the common cargo boat. Where the other is retained, its size is reduced. *Doondahs*, it will be afterwards shewn, requiring five feet and half an inch to float them, are in use upon the river below Bukkur; but above that fort, I have not met a single boat of a draft exceeding three feet nine inches.

Mittun to Kalabagh.—The Indus in this section, as high as Dera Ismail Khan, is equally well suited to navigation, though not better than that last described. It also in some degree resembles that section in its parallel branches and broad bed. Between Dera Ismail Khan and Kalabagh, the difficulties of the navigation increase.

Kalabagh to Attock.—The downward voyage may be made throughout the year; but from April to October the passage is hazardous, and rarely attempted. Boats at all seasons may ascend as high as Sharkee, a village on the right bank of the river, a few miles above Mukkud, but between that and Attock the upward navigation is restricted to the winter months, and even then a boat must have a double crew, and be of a build that does not obtain below Kalabagh, called a *dug-gah*. For a description of this vessel see the 7th article in this Report.

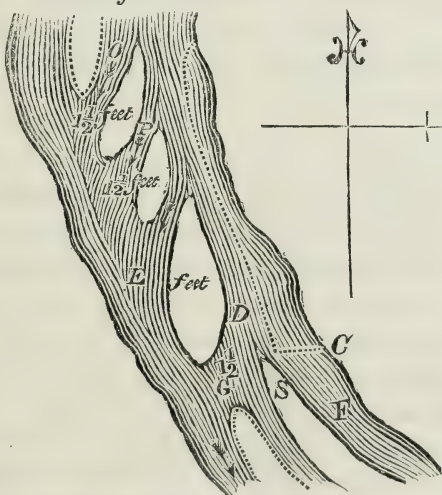
III.—Of the Soundings in Indian Rivers.

After having sketched the greatest capabilities of the Indus from the draft of its boats, it will not be necessary to enlarge in this place on the nature of its soundings. South of Mittun-kote I have inserted, under sectioned heads, specimens enough to shew the characters of the Channels,* referred to. A table marked maximum, minimum, &c. is quite the thing for a thermometrical register; but such a formula for soundings, when applied to an Indian river, mars its own object,

* See Appendix, Table V.

unless indeed it be based on the accumulated experience of years. That I do not therefore crowd these pages with figures, is from a firm conviction of their inutility. They are in fact positively injurious; for when a practical man at a distance casts his eyes over the contents of a table, purporting to give the soundings in a river's channel, and finds the least depth to be two fathoms, he very naturally concludes that a boat constructed to draw only nine feet, will navigate the said river. No conclusion could be more erroneous, the reasoning is suited to the equable streams of the new world; but not applicable to the ever-changing channels of our Indian rivers. To what other causes can we attribute that crude digest of a prospectus for introducing steam upon the Indus for commercial purposes, that lately reached this country from England, authenticated by names of the first rank and respectability in the mercantile world? One of the articles in the proposed Joint Stock Company provided for stationing a ship of one thousand tons, (an old East Indiaman,) as a depôt inside the river. Such a vessel could hardly come in sight of the Sindian coast. Lieutenant Charles' survey of the mouths of the river has made us acquainted with their actual condition, and in another part of this report, what should be the draft of the Indus Steamers,* and this decision is the result of a most careful examination of the river, both in its dry season and during its freshes.

Sketch of a Reach below Sehewan.



* See the 8th Article in this Report.

IV.—Of the mode of Navigating the Indus.

The diagram on the preceding page, represents a reach of the river below Sehewan. The better to illustrate the figure, I shall suppose a boat deeply laden at the village Y is about to start on the downward voyage, and that her "*meerbar*," or man in charge of the boat, is a stranger to the river. Leaving the village, he would doubtless take the large channel indicated by the colored arrows, without regarding, if indeed they had been seen, the numerous offsets on the right hand ; when abreast of the shoal S, a decrease in the depth of water would for the first time apprise him of his having lost the fair channel, and shortly after this intimation had been received, the boat would ground on the bar G. Now by inspecting the sketch, it will be seen that between the villages X and Y, the deep channel has shifted from the left to the right bank of the river. The alteration has been effected by the silent drainage of the lateral channels O, P, E, and D, and by the unperceived departure of a large body of water over the bar extending from S to G into the back water F. E is the passage the boat should have pursued ; but this knowledge could only have been the result of a previous careful examination, appearances at starting being decidedly in favour of channel D. The nature of these changes will be rendered still more evident, by inspecting a section of the river's bed. Take for example the following :—

1st. Channel.

2nd. Channel.

$\overbrace{3.4.4\frac{1}{4}.4\frac{1}{4}.3\frac{1}{2}.2\frac{1}{2}.2.}$
 $\frac{3}{4}\frac{3}{4}\frac{3}{4}\frac{1}{2}\frac{3}{4}\frac{3}{4}\frac{3}{4}1.1.1.$
 $\overbrace{1\frac{1}{2}.1\frac{1}{2}.2.2\frac{1}{2}.2\frac{1}{2}.2\frac{3}{4}.}$
 $1.1.1.1.\frac{3}{4}\frac{1}{2}\frac{3}{4}\frac{3}{4}\frac{1}{2}\frac{3}{4}\frac{3}{4}\frac{1}{2}\frac{3}{4}$

3rd. Channel.

$\overbrace{1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.2.2.1.1\frac{1}{2}}$ fathoms. Such a line of soundings is not uncommon, though this one differs from the usual section in having an additional channel, two being the more usual number. The junction of these is not effected at a particular spot, but is, on the contrary, the result of a parallel course of many miles, during the whole of which distance the change is gradually being effected. They thus imperceptibly glide into each other ; and should the channel selected by a boat descending the river, be that which the stream is in the act of abandoning, she must be moved into the new formed channel as soon as a decrease of soundings gives warning of the fact. Now it is deserving of remark, that when the necessity of change first becomes apparent,

there is seldom more than three-quarters of a fathom water on the spot separating the channels. Whether alterations in the channels of other large rivers are brought about in a similar manner, I am not aware ; but this peculiarity, if it can be so termed, is familiar to the boatmen on the Indus ; and with a description of the manner of their meeting it, and of the precautionary measures to which it gives rise, I shall conclude this notice of its navigation.

No vessel with cargo on board makes a downward voyage unaided by a pilot boat ; it is called here *sooe*, or guide. These are small cheap skiffs managed by a couple of men, one of whom standing on a platform in the bows gives the depth of water, while the other, with his scull over the stern, steers the boat. Cheap as the services of a pilot may be had, the protracted length of the voyage makes it a burden too weighty for a single cargo to bear, and the custom therefore is, for boats to drop down the river in fleets, or by divisions, when *sooes* become so multiplied, that to every two or three large boats a tender is attached. Grain being the only freight, all shipments are made at a stated season of the year ; and as the quantity of corn produced on the banks of the Indus in autumn far exceeds that cut down in spring, the winter fleet outnumbers in an equal proportion that which takes its departure about midsummer. In February 1837, when the river was at its lowest level, I counted forty-two grain laden boats pass Sehewan on their way to Hyderabad, whither the surplus of the Upper Provinces is yearly exported.

The largest of these boats drew five feet and half an inch of water, and the manner of conducting the fleet was as follows:—When the day's stage has been fixed, a detachment of *sooe* went ahead to sound, into each boat there being, besides her own small complement, two or more of the *doondah's* men. On their arrival all is bustle and noise in the fleet. The fastenings of the boats are cast off, the oars are plied, and the huge hulk, preceded by her guide, shears out into the stream.

If the *meerbars* have confidence in the channels, and the wind be fair, a large square sail is set, and the unwieldy *doondah*, deep though she be, outstrips her tender, and seems to skim the surface of the water ; —such a fleet in motion is worth seeing. First, the large white sail of the headmost boat is discovered at the top of the reach, then another,

and another, until the surface of the river becomes studded with those uncouth, yet really interesting objects. As may be supposed, this mode of navigation is tedious, the daily stages not averaging more than from ten to twenty miles. Delays too are not unfrequent in the dry season; but never exceed fifteen days, and rarely extend to half that number.

When there is a prospect of a long detention, it is customary for large boats to transfer a portion of their cargo into smaller ones, and take it on board again when the shoal water is past. In high wind, the boats remain fast by the bank of the river. The two following Tables are inserted in illustration of the above remarks :—

Tables, shewing the cargo draft of the largest boats upon the Indus, with the least water in the continuous channel, during the dry season of 1837.

<i>Draft of Boats.</i>			<i>Channel.</i>		
Class of Boats.	Cubic Draft.		Gunwale above water line.	Places.	Depth.
	Ft.	In.			Ft. In.
1st Class,	5	0½	10 Inches.	Gooloo,	3 8
2nd ditto, ..	4	9	9 ditto.	Lillong, ..	4 4
3rd ditto,	4	3	9 ditto.	Mycotta, ..	4 8
4th ditto,	3	3	7 ditto.	Bulalpoor, .	4 1
5th ditto,	3	0	5½ ditto.	Kaira,	4 8

The places in the above Table are all situated between Sehewan and Roree; but they furnish a good example of the depth in other places.

Boats descending in the freshes, proceed as above described. In this season the length of the voyage is much shortened, though attended with considerably more risk. A pilot is still required; but a previous examination of the channel is not always considered necessary.

The following Table gives a statement of the downward voyage at opposite seasons of the year. It embraces the whole navigable extent of the river, and includes Pilotage where such a custom prevails. The voyages are such as are rarely performed even by Sind boats, even when the river is clear, and other circumstances favourable.

The Downward Voyage.

Stages.	Dry Season.	Freshes.	Pilotage.
Attock to Kalabagh,	1½ Days	1 Days	— — —
Kalabagh to Dera Ismail Khan,	7 ditto.	2 do.	6 Rupees
Dera Ismail Khan to Dera Ghazee Khan,	10 ditto.	3½ do.	6 do.
Dera Ghazee Khan to Mittun,	4 ditto.	2 do.	3 do.
Mittun to Roree,	6 ditto.	3½ do.	a boat 18 Rs.
Roree to Sehewan,	7 ditto.	4 do.	do. 16 do.
Sehewan to Hyderabad, ..	3 ditto.	2 do.	do. 12 do.
Hyderabad to Sea,	2½ ditto.	2 do.	do. 12 do.
Total	41 Days.	20 Days.	

The upward voyage is performed by the aid of the wind and track rope. This last mode of procedure is slow, but certain; and averages about eight koss, or thirteen miles, a day. With a strong favourable breeze, the daily progress is increased to twelve and eighteen koss. The prevailing winds during the year, and their consequent influence on the navigation of the river, are given under the next head, and it will there be seen that the freshes, far from presenting any obstacle to the upward voyage, are more favourable to it than otherwise. During their continuance, a south wind blows from the sea to Kalabagh; and though less steady on the Upper Indus than in the lower part of the river, it is a great service to navigation, since the time consumed by an up-river voyage, in the dry season, may be stated as one-half in excess of that required to perform it in the swell. Annexed is a Table, shewing the relative time occupied by the voyage at opposite seasons of the year:—

The Upward Voyage.

Stages.	Dry Season.	Freshes.
Seaport to Hyderabad,	15 Days.	7 Days.
Hyderabad to Sehewan,	8 ditto.	4 ditto.
Sehewan to Roree,	14 ditto.	7 ditto.
Roree to Mittun,	14 ditto.	6½ ditto.
Mittun to Dera Ghazee Khan, ..	10 ditto.	4 ditto.
Dera Ghazee Khan to Dera Ismail Khan,	11 ditto.	10 ditto.
Dera Ismail Khan to Kalabagh, ..	12 ditto.	7 ditto.
Kalabagh to Attock,	15 ditto.	Impracticable.
Total, ..	107 Days.	45½ Days.

Of the foregoing Tables it may be remarked, that under a different management, the number of days occupied in performing the voyages, especially up-river in the dry season, will be much reduced. At present, *time* is no object to the Sindian; and besides, he loads his boats so deep, that the ripple caused by only a moderate breeze, endangers her safety.

V.—Of the Winds and Weather in the Valley of the Indus.

The prevailing winds of the Indus conform to the direction of the river, blowing for six months up the stream, and as many down it. From April to September the breeze is southerly, and during the other months of the year it comes from the north. An east wind of twelve hours' continuance is rarely felt. When a change in the prevailing direction takes place, the wind veers by the west from 10 P. M. till noon of the following day; the wind is usually fresh. The evening and afternoon too often oppressive, for want of the usual breeze. This last remark is, however, more especially applicable to the weather on the Upper Indus.

In Lower Sind it is often just the reverse, the breeze there freshening up about 3 P. M. However warm the day may have been, the nights, with few exceptions, are cool. A more particular account of the prevailing winds will be found in the annexed Table:—

Prevailing Winds.

Months.	North.	South.	Calm and Variable.
January,	29	2	0
February,	22	6	0
March,	17	13	0
April,	7	15	8
May,	1	29	1
June,	0	28	2
July,	0	28	3
August,	6	27	4
September,	0	24	0
October,			
November,			
December,			

The south wind.—It reaches Kalabagh at the entrance of the mountains, and last year was as fresh and steady upon the Upper as on the Lower Indus. This wind is believed by the boatmen of the latter to cease at Sehewan, and in my report on the inundation in 1836 I mentioned the circumstance. Such, however, is not exactly the case. South of Sehewan a spur from the Hala mountains comes down upon the Indus, which intercepts the breeze, and turns it off from the river, so that above the town for many miles calms and sultry weather are characteristic of a season remarkable at other places for the steadiness of the prevailing wind; yet though this peculiarity is thus shown to be local, another circumstance leads me to think, (contrary to my own experience,) that the south wind is less fresh upon the Upper Indus than lower down the river. Above Roree the boats have but a single reef band in their sails, while at Hyderabad it is no uncommon thing to see them scudding before the breeze with their sails double and even triple reefed.

The north wind is not so steady as the south, but is oftener more violent while it lasts; clouds of sand darken the air, and compel the trackers to bring their boat to the bank. This wind is cold in November, December, January, and February; the thermometer at sunrise is often but a few degrees above the freezing point. During the season that northerly winds prevail, gales from the south are not infrequent. These are always scarce, and usually, last three days. The change is marked by cloudy, rainy weather, lightning, and thunder.

Variable Winds.—During those sultry breezes that follow the daily lulling of the prevailing wind, the calm is often agreeably broken by light breezes off the river.

These are seldom sufficiently strong or lasting to benefit navigation, but in tempering the heat of the atmosphere, and conducing to the health of the numerous tribes that dwell on the banks of this river, they serve an important purpose.

Storms.—Plenty of warning is always given, and ample time afforded to secure the boat, which should be done either under the weather bank of the river, or the lee side of an island or sand bank. An unsheltered position in deep water, with the open river to windward, generally settles the fate of an Indus boat. If loaded, she

at once fills and goes down, and if empty, the shaking produced by a short chopping sea soon opens the seams of a vessel that has no beams to hold her frame together.

In a river danger from this cause may appear slight; but when the stream and wind are opposed to each other, a short breaking sea is formed, that will swamp a six-oared cutter at a grappling. Most of the boats that are lost on the Indus, are wrecked in the manner here described. Gales of wind are experienced throughout the whole line of the Indus. They are more frequent near the mountains, than in the neighbourhood of the sea.

VI.—Of the Boats upon the Indus.

The boats upon the Indus are of simple construction, and their figure is perhaps the best that could be given, considering the kind of navigation in which they are employed. They are easily constructed, not very expensive, and for stowage of cargo, no form could be better devised. Their proportions though not elegant, are pleasing, and tracking or under sail, their appearance is pretty.

The employment of the Indus craft is confined to harvesting the crop, serving the ferries, and keeping large towns in fuel. For these purposes, the supply is ample. Second, between the sea and Attock two kinds of vessels are in use, the *zohruk* on the Upper, and the *doondah* upon the Lower Indus. In boats belonging to the latter class, a slight difference in the build gives rise to a further classification, and of this description of vessel the *moohanah*, (boatman,) enumerates more than one variety. But before particularizing each, a description of the *doondah* is necessary. Her good and bad qualities are shared alike by them all, and the following notice of this boat is therefore applicable to every vessel on the river :—

Form and method of construction.—The hull or body of the boat is formed by the junction of three detached pieces, namely, two sides and a bottom—at variance with our ideas of naval architecture; the three parts are first separately completed, and then brought together as a cabinet-maker does the side of a box. The junction is thus effected: when each of the three parts that are to form the whole is completed in itself, the sides are carried to the bottom of the boat, and at

once secured by crooked pieces of timber to the flat future bottom of the *doondah*. To bring the bow and stern up to the corresponding parts of the side is more difficult; and to effect this, many days are necessary. Where the bow and the stern are to rise, the planks are lubricated with a certain composition, which gives them a tendency to curve upwards, and this is further increased by the application of force. The extremes thus risen, a tackle is stretched between them, and by constant application of the heating mixture, and a daily pull upon the purchase, they rise to the required angle, and are secured to the side, while an advantageous curve is imparted by this process to the plank in the boat's bottom. The bow of the *doondah* is a broad inclined plane, making an angle of about 20° with the surface of the water. The stern is of the same figure, but subtends double the angle.

Advantages of this construction.—To the slight curve in her bottom planks she is indebted for the following advantages:—In descending a river, should she strike upon a sand bank the boat turns like a top, and presents no stationary point for the stream to act against. A merely flat-bottomed vessel would probably shew her broadside, and the stronger the current was running, the greater would be the difficulty in getting such a boat again into deep water. Thus in a situation where the *doondah* experiences but a little inconvenience, and occasionally it may be a few hours' detention, a boat of another and but a slightly altered form would be very awkwardly placed, though her safety might not be actually endangered. In passing through eddies, the common or wedged-shaped bow dips considerably, while the form of the *doondah's* prow has a tendency to lighten her draft, and the more rapid the current or the greater her velocity, the more buoyant she floats. When forced out or against the river's banks—an accident which the defective steerage of the *doondah* renders of frequent occurrence in tracking—the form of her bow, where the bank is not too high, parries the violence of the shock. A greater defect in the common wedged-shaped bow for river navigation, (at least in those of the Indus, where the current is very irregular,) is the surface it presents for currents or cross-currents to act against; these force the boat from its course, and deprive the helm of its power. In tracking this is often seen; and I can remember rather a ludicrous instance which occurred to the *Indus Steamer*,

whilst coming up the river to Hyderabad in 1836. The day to which I allude, it was necessary to second the power of the engine by a tracking party on shore, and a number of Hindoo countrymen were employed for the purpose. All went on well, till the bow of the boat got inclined to the direction of the current, when out she shot like an arrow into the stream, and with her dragged the trackers.

Casting off the drag rope prevented accident; but the situation in which it left the Hindoos, was not a little grotesque. Between the firm ground and the river lay a strip of recently placed alluvium, and in this the Sindees were planted at various depths, from the middle downwards.

The present great defect in the form of the *doondah* is bad steerage. By rounding her quarter, and making other judicious alterations, this could be improved. To fit them for conveying merchandize, they require to be stronger built; and for the convenience of the merchant, to have better accommodation; in fact to be restored to the state in which an early traveller, Captain Hamilton, described them when trade flourished by the Indus, and its arrangements were such as to attract the notice of an intelligent European.

Rig of the Boats.—The masts are poised upon strong beams resting athwart the gunwales. Moving on this *fulcrum* their management is easy, and the masts can be lowered down or placed upright at pleasure.

The sail is hoisted behind in preference to before the mast for several reasons, the principal of which is, that as the boat sails only with a favourable wind, it is never necessary to brace or haul up the yard, and fewer hands suffice to manage the boat.

The *jumptee* is the state barge of the Sinde Ameers, and is used by them and their principal officers on all occasions, whether of business or pleasure. Perhaps the appearance of this boat, as she approaches the capital, is more characteristic of the Indus and of Sinde, than ought else to be seen in the country. On this day her *meerbar* puts on clean clothes, and the national cap received from the Ameers on a recent river excursion. The bright hues of the cap, formed by the gaudiest coloured chintz, vie with those of a Kilmarnock bonnet, or a Paisley tartan. The crew are dressed becoming the occasion, and as they bend to the track rope, the breeze

distends their ample robes, and a further character of stateliness is imparted to the *jumptee*. Large red flags were over her stern, and from the raking mast streams a long party-colored pendant that anon skims the water, as the breeze lulls and freshens. In the bow of the boat is a small crimson pavillion, in which royalty reclines, and in the other extreme of the vessel, a roomy cabin of elaborately carved work, for its numerous attendants.

The steersman on an elevated platform, stands in bold relief, and while he guides the boat, encourages the trackers. The *jumptee's* crew are a noisy set; but for aged men, wonderfully good humoured. They are divided into two gangs or watches, and are as partial to a cup of good *bang*, as sailors are to grog. These boats are decked, and of considerable tonnage. One which I saw at Hyderabad, measured one hundred and twenty feet over all, with a beam of $18\frac{1}{2}$ feet; her draft of water was two feet six inches, she pulled six* oars, and had a crew of thirty men. They are built of Malabar teak, chiefly at the ports of Mughreeb and Curatchee. *Jumptees* are seldom lost; the only danger to which they are liable is that of having their bottom pierced by sunken trees. Their more substantial build keeps the frame of the boat together in situations where the poor-pieced shell of a *doondah* would fall asunder. The *doondah* is the cargo boat of Sinde; her principal and almost her sole employment being, the transport of grain.

The Cowtell.—This again is the ferry boat of Sinde; her construction adapts her for this service, and for conveying houses up and down the river. From her great beam and high draft of water, she is a faster boat than the *doondah*. In all their excursions on the river, the Ameers are accompanied by many boats of this description. The class is not numerous, and most of the boats are the property of government.

The *doondie* is common from the sea to Mittun, and the boat most generally used in the fisheries, both upon the river and its *dunds*, (small lakes). It is the smallest description of vessel upon the Indus, and at the same time one of the most useful. Two men are ample to its management; but a man and wife are its usual crew.

The Zohruk.—What the *doondah* is in Sinde, the *zohruk* is upon the Upper Indus, namely, the common cargo boat of the country. The

planks of this vessel are held together by clamps instead of nails, and the junction is often neatly enough executed. This class of boats is not so strong as the *doondah*, but they sail faster and draw less water. They are more roomy than the *doondah*, and though less adapted for the conveyance of goods, are much superior for transporting troops.

The Duggah.—This is the clumsiest, and at the same time, the strongest built boat upon the Indus. She is confined to that rocky and dangerous part of the coast, between Kalabagh and Attock. The form of the boat differs but slightly from that of the *doondah*. The *duggah* has neither mast nor sail. Her name is the Sindean word for cow, and the awkward sluggish motion of this boat shews that it has not been misapplied. If the *duggah* drops down the river to Mittun, there she must remain, and be sold for whatever sum she will bring; for to drag her up against the stream to Kalabagh, would cost more money in the hire of men, than the boat is worth.

Management of the Boats.—Under sail the very best of them will not be within eight or nine points of the wind. Dropping down the river with a contrary wind, the mast is unshipped, as also the rudder, and the latter is replaced by two sculls. Should the wind blow strong, a boat without cargo can make no progress, and the safety of one laden, is endangered by the chopping sea it raises.

Tracking is performed as follows:—the boat is provided with a track rope at least a hundred fathoms long; it is rove through the uppermost sheave-hole at the mast head, and the inner end fastened to the rail or platform on which the steersman is standing. On the hauling post before the mast, is a guy, called a "*lagh*," the lower end of which passes through a ring bolt in the bow of the boat. This guy is of as much utility as the helm itself. Before the boat starts the track rope is middled, and the inner half coiled down under the feet of the steersman: one man is stationed by the guy, and the remainder of the crew toggle on to the shore part of the line. Thus yoked they march at the rate of two miles an hour up to the knees, often higher, in water or in mud. Whilst thus advancing the foremost walker calls out "*shoal water*," on which the inner end of the clog rope is let go, the guy eased off, the helm put to one side or the other, as the case may be, and the boat thus relieved, avoids taking the ground by shooting out into the stream. The shoal passed, the guy

is shortened, the line again middled, and the crew advance at the same slow pace as before. Boats should have two track ropes, and when turning the bends of the reaches, both should be on shore. They should also be provided with a heavy grapnel to drop, in the event of accident to the track ropes.

The steep banks in bends of the river should be avoided, for under it circles a current in a contrary direction to that of the main stream, the quick gyratory motion of which is constantly exerted to the destruction of the bank, and that of such boats as frequent it.*

Boat Building, Materials, Suggestions.—Boats are constructed according to established usage, which has fixed a proportion between the beam and length of each boat. The tonnage is calculated on the boat's bottom, from the point where the stem and stern rise. The angle at which it takes place is matter of taste, a high projecting stern improves the steerage, and a low bow gives speed. The banks of the *Indus* are deficient in almost every article used in constructing the boats on the river. The Lower *Sinde* is supplied with plank and spars from the Malabar coast, and with coir and cordage from the same quarter. The Ameers of Hyderabad, are, however, the chief, almost the sole purchasers. The *Moohana*, unable to give the high price asked by Cutch boatmen for teak plank, exhibit both skill and ingenuity in building boats of timber of their own country's growth; for this the orchard is robbed, and the country for miles round laid under contribution. In the bottom of a single boat, teak, baire, fir, babool, and the curreet tree are sometimes seen together, and in the same extent of workmanship, six hundred and seventy three patches have been counted.

The Upper *Indus* is principally supplied from the banks of the Chenaub, where the talee tree, the sissoo of Hindostan, is seen with a trunk measuring twelve feet in circumference. Three such trees furnish plank enough to build a large sized *zohruk*.

The Attock boats are built of good fir, brought down the Cabool river, and from the forest of the Lower Himalaya.

Iron Work.—The Lower Indus is supplied from Bombay, and the upper portion of the river from the mines of Bunnoo and Badjour.

* See an example of this in Table VI. of the Appendix, headed Irregularities in the bed of the *Indus*.

It is customary to purchase the latter in the matrix, and to allow a per centage to the blacksmith who smelts the ore, and works it up into nails.

Cordage.—Upon the Upper Indus the rope is either of hemp, or formed from the culm of certain tall reedy grasses, very plentiful on the banks of this river.

The tools of the Sinde carpenter are as little diversified in form as those used by the same class of artificers in India. The absence of good material to work upon sharpens his inventive powers, and gives a manual dexterity that improves the execution of whatever he may have to do, when really good timber comes before him. If a curve is to be imparted to one or a dozen planks united, chaff moistened with water is the Sinde carpenter's store ; or what answers the purpose still better, the dung of animals, and more especially that of sheep.

Teak-built boats are much prized by the *Moohana*, as are those of cedar and fir construction, which come from Pind Dadun Khan, on the Jalum. Such boats, when well put together, will run forty years ; but from seven to ten is the duration of those patched up with the jungle wood of the country ; and if care has not been used to see that the wood employed in her construction was originally well seasoned and selected, a less number of years brings on the decrepitude of age, when to delay a thorough repair, is to lose the boat.

Adaption of the Indus Boats, for the transport of military stores.—They are not calculated to bear the weight of ordnance, such as a battering train ; and at the present moment there is not a boat upon the river, which a Committee would declare efficient for the transport of these heavy guns. For this purpose, the boat should have a perfectly flat bottom, that the weight of metal may be equally distributed over the immersed portion of the hull. The sides too require to be fixed to the bottom in a more secure manner than is at present customary. The knees which connect them should be formed of iron, in preference to wood. If shot is to be carried, the bottom of the boat should be planked over the beams, as well as under them. The latter is all that is done at present ; but if this is not guarded against, the nails will draw, and the shot fall through.

Should it become desirable to increase the amount of tonnage upon the *Indus*, boats could be built at Bombay, Hyderabad in Sinde, or

Pind Dadun Khan in the Punjab. If at the former place, it would be desirable there only to prepare the frame; but to build the boat, that is, to put her together in the river, good artificers are to be had in the country; but the introduction of a few superior workmen from the dockyard, with a clever native foreman or overseer would be necessary. A smith is an indispensable accompaniment, and when steamers are introduced, this establishment should, to be efficient, be possessed of science, material, and skill. If Hyderabad were to be selected for building boats, still all the material must come from Bombay. If Pind Dadun Khan had the preference, a small supply of cedar plank might be there calculated upon, and the services of better workmen than are to be procured in Sind.

Boat Hire.—In this charge there is some incongruity; yet it does not appear to exceed the rate of hire that prevails upon the Ganges.*

VII.—Of Steam Vessels for the Indus.

Naturally solicitous to be acquainted with the present state of internal steam navigation upon the Ganges, on presenting Government with the result of my experience on this river, I addressed a letter, forwarding a list of queries on the subject, to Mr. C. B. Greenlaw of Calcutta, and through the kindness of that gentleman, I have been favoured with the accompanying valuable report from the pen of Captain Johnston, controller of Government steam vessels,—an officer more conversant with these matters than any man in India. In submitting this document to his Lordship the Governor General in Council, I will only remark, that in every essential point the class of vessels described by Captain Johnston, seems well suited to the Indus, and the economy that pervades the steam establishment upon the Ganges, is worthy of imitation here.

Towards the close of the year 1835, when the *Indus* steamer arrived off Hyderabad, one of the Sind Ameers expressed a wish to be possessed of a similar, but a more powerful vessel. Captain Burnes, who was then at that court, requested my opinion on the description of vessel best suited

* See Appendix, Tables IV, VII, VIII, for the tonnage, price, and hire of Indus boats.

for the Indus, and from the reply to his communication, the following paragraph is an extract, from which it will be observed, that I had then fixed for the draft of an Indus steamer, the exact number of inches, which boats upon the Ganges draw.

Paragraph 11th.—"In a preceding paragraph, I stated that powerful vessels were required on the Indus; the reason is this: In some parts of the stream, the current has a velocity of five and six knots an hour.* It will, therefore, be wise to possess a sufficient power, since steam is now so under controul, that in the downward voyage, where accidents are more liable to occur, it can be reduced at pleasure; but if the engines be originally too weak, a new boat is a costly remedy. Two feet six inches is a good draft of water, and ought not to be exceeded, the boat to have great beam, not much length, and no keel."

Remarks on the Steam Boats of the Ganges, furnished by their Controller, Lieut. Johnston, R. N.

"Four iron steam boats are now employed in inland communication; each steam boat is 125 feet long over all, 22 feet broad, and tows an accommodation boat of the same length, and 20 feet broad, with a hold of five feet deep, capable of towing 4000 feet of cargo, weighing 40 tons, the boat's draft when so loaded, not exceeding 30 inches. The iron sides of the boat are 5 feet deep, above that is a light superstruction of wood in the accommodation boat; between the deck, which forms the hold and the deck on which the crew and passengers walk, the height is nearly 7 feet, and the included space from one end of the vessel to within 20 of the other, or fore end, is divided into cabins and dining rooms, &c. Fourteen cabins are available to passengers; four of 12 feet by 9; four of 9 by $8\frac{1}{2}$; and six of $8\frac{1}{2}$ by $6\frac{1}{4}$; a dining room 20 by 12; two bathing rooms; two pantry or store-rooms, a butler's room; guard room, and two cabins for officers. Each cabin has a water closet; the windows or venetians are 4 feet deep by $2\frac{1}{2}$ wide. In the steam boat, the iron side is continued up in the centre to the height of the beams, which carry the paddle shafts, and the light paddle boxes

* I had not, when this was written, seen the Indus during its freshes.

are of wood. The engines are double, of 60 horse power, oscillating; they consume of Burdwan coal about 10 pounds per horse power per hour, and carry at a draft of 30 inches, about 450 maunds. In the steamer there is a large cabin abaft the boiler, not habitable by Europeans in the warm weather; but very comfortable in the cold. Before the engines, there are two cabins on each side, 8 feet by 5, with a space between that forms a mess room. There is also a very light cabin on the deck of $\frac{3}{4}$ inch board 8 feet by 10; the engines are before the boiler; the steamers have one mast and top-mast, on which they set square sails when the wind is fair. The boat, (a good stout cutter,) is always towed close up to the stern of the accommodation boat. The anchors are 4 and 5 cwt., besides stream and kedge anchors, grapnels, &c. They are well furnished with ground tackle; chain cables are alone used. The diameter of the paddle wheel is 16 feet, the breadth 6, the board 6 feet long, 8 inches deep, and 18 on each wheel: they are preferred of fir, and are 2 inches thick. The centre board, when the vessel has her coal on board, is 3 inches below the water surface. The greatest speed of the steamer when alone, is 9 statute miles an hour; with the accommodation boat in tow, 7 miles.

“The contractors have their coal in dépôts on shore, and send it in boats to the steamers when they cannot lay along-side the bank. Coal is taken by weight, and one hour allowed for the delivery of one hundred maunds.

“In the bow of the accommodation boat and in the stern of the steamer, are fixed strong posts well secured, and at the same height a saddle is bolted on each, and protected by an iron plate. An iron hoop 6 inches deep is on the post also above the saddle, in contact with it; a beam of 18 feet long, 14 inches broad, and 5 inches thick, with jaws at each end, connects the boats by resting with its two ends on the saddles, and is secured round the posts with a chain with a hook and lever, so as by letting go the end of the lever, to detach the chain in an instant, and allow the boats to separate. There are also hawsers from each bow of the accommodation boat to the paddle boxes of the steamer, which serve to guide the boats, and assist the steering; the following boat acting as a powerful rudder to the preceding one.

“Progress is more easy and safe up the Ganges during the dry season. There is little danger at any time in ascending the streams, but much in coming down; most during the dry season, when the channels are all defined, and the commanders are instructed to come with great caution, dropping through the difficult reaches with the head of the boats up the stream. They are instructed to consider the preservation of the boats the first consideration; speed a secondary one. In the dry season, the voyage downwards frequently occupies sixteen or seventeen days; in the swell five, six, seven, and ten; the upward voyage during the greatest strength of the current occupies from twenty-five to thirty days; at other times nineteen to twenty-three, and twenty-five in the swell. The current of the Ganges is seven miles in the dry season.

“The boats in the swell can generally evade the strength of the current by running over, or on the edge of sands; in the dry season they must generally encounter it in full force.

“There is an establishment of Pilots, (native fishermen.) The distances vary from eighteen to twenty-six miles, through which they are required to be acquainted with the channels; nevertheless, a boat seldom makes a voyage without grounding, and the principal injury the boats sustain, is coming in contact; under these circumstances, it is nearly confined to the superstructure. On one occasion only a pair of boats suffered under water, being thrown against rocks by a strong eddy when descending under steam; each boat had a hole forced through the bottom; they were easily stopped, the injury being confined to the portion of metal actually in contact with the rock. A wooden boat would have been shattered by the concussion.

“It would not be possible to construct wooden boats to retain their form as the light draft the iron boats do; and I can conceive no means of improving on the boats we have, limited, as by the nature of the rivers we are, to length and draft of water. I believe, that for the Ganges above Allahabad it will be in my power to fix a steam boat not to draw more than 22 inches, with 24 hours' fuel, the economy of weight will be confined to the superstructure, the iron hull being the same in point of form and dimensions as those now plying, the metal a little higher.”

(Signed) JAMES H. JOHNSTON.

There is one point in the above report, where I conceive a different arrangement must be made upon the Indus to what prevails on the Ganges. Most of the fuel *depôts* on the Indus must be afloat. If wood firing is used, there is no alternative, for otherwise the time lost taking it on board will cancel all the other advantages of steam.

The banks of the Ganges are high, substantial, and compared to the banks of this river—permanent. Towns overlook the river ghauts, or landing places are constructed on the banks, and the steam boat at most of the stations has only to shore alongside the ghaut and receive her fuel.

It is very different with the Indus. Towns stand within two miles of the river, and the banks are ever varying their outline. I would therefore recommend that large manageable flats be used for this purpose, and anchored at such distances apart as subsequent experience may suggest ; their draft should be restricted to 3 feet 6 inches, and each should have a small boat attached, by which means the crew of the flat would be able to keep the floating well supplied from the shore store.

I am further of opinion, that were the *zohauk's* defective steerage overcome, steamers built upon her model will prove efficient boats.

VIII.—Of Fuel for Steam Boats.

The jungle on the banks of the Indus contains the following trees:—

1. *Mangrove*.—Found in the Delta, is plentiful, and burns well. Though it attains no great height, it has sometimes a circumference of 12 feet.

2. *Kundie*.—Rarely exceeds 9 feet in height, and is found, though not confined to the locality under the Lukkee mountains, between Chandkote and Sehewan. In Lower Sinde, this wood is scarce ; but twelve miles south of Mittun, on the west bank of the river, is an extensive jungle, in which this is the most common tree ; the hardness of its fibre and the crookedness of its grain, make it in great request among the boat-builders.

3. *Baun*.—Little of this wood is seen below Hyderabad ; but between that capital and Sehewan the tree is common. As a fuel, it is useless.

4. *Jall* or *Pello*.—This tree is found in every part of the river's course. Between the river and Desert, two descriptions of trees prevail. Tama-

risk fringes the river, Jall or Pelloo the desert ; the latter as a fuel is not superior to Baun.

5. *Tamarisk*.—From the sea to Kalabagh, this wood is more or less plentiful ; almost any quantity of it is procurable ; but the large wood is distant from one to twelve miles from the Indus, and considerable expence and delay must necessarily be incurred in transporting it to the river. *Tamarisk* is the common firewood of this country.

6. *Kurreel*.—It is plentiful in Sinde ; but makes an indifferent fuel ; it gives out volumes of smoke, but emits no flame. This wood is generally crooked, and its fibre being hard, it is advantageously used for knees of boats, and wherever curved lines, strength, and durability are sought to be combined.

7. *Loohera*.—Between lake Munchur and the mountains, grows a tree of this name, of a dwarfish size, and very common ; as a fuel it is even worse than the last described.

8. *Tallee*.—This tree is not common on the banks of the Indus, and the few that do occur, are found near villages, in single trees. It attains a large size, and is much in request amongst the boat-builders. It burns well ; but the tree is too valuable to be cut down solely for firewood.

9. *Babool* or *Bubber*.—This tree is plentiful in Sinde ; but becomes less as we ascend the river. It makes an excellent fuel.

Shikargahs or *Hunting Forests*.—They are numerous below Sehe-wan ; but above that town, they are not found. The trees they contain are mostly *Tamarisk* and *Babool*. These forests at some places fringe the river for three and four miles ; but their medium width seldom exceeds one. In a few of them are trees of a large size ; but far the greater number are merely extensive thickets, containing saplings of sorts, tall grass, and reeds, the spontaneous offspring of a rank inundated soil.

In December 1835, I made several experiments with the *Indus* steamer to ascertain the relative strength of wood and coal fuel. The result was as follows :—*Tamarisk*, when newly cut down, would not generate enough steam to keep the engine, though working only one-half power. If the billets were large and thoroughly dry, it answered the purpose better ; though I consider this wood at best but a very indifferent fuel. *Mangrove* and the *Babool* trees are much superior ; burning equal proportions of the two last, the furnaces were reple-

nished once in seven minutes : with coal, (not however of a very good quality,) every fifteen. Coal has thus an advantage over wood fuel in something more than the proportion of two to one, and when the superior performance of machinery driven by the former is taken into account, it is doubtful which is the more economical plan to navigate the Indus, with coal from England, or the jungle now growing upon its banks.* The question resolves itself simply into one of expence, for there is wood enough on the banks of the Indus, to keep two or more steamers constantly plying for years to come.

On this subject, Captain Johnston, the Controller of Government Steam Vessels, has made several experiments with steam boats on the Ganges. The result is already before Government ; but having obtained, through the kindness of that officer, a copy of his report, the nature and value of its contents is my apology for introducing it here.

Report on the relative value of Wood and Coal, by Captain Johnston, the Controller of Government Steam Vessels.

On Friday the 27th instant, I ordered the steam to be got up on board the *Experiment Flat*, and ran for two hours on the ebb tide between Fort William and the Reach below Budgebudge, and consumed nine and half maunds of coal, making on an average 29 revolutions. I then returned with a flood tide, and in two hours consumed 11½ maunds of wood, making on an average 21 revolutions. I also noted the time we were running the same distances under coal and wood steam ; the periods were 90 minutes with coal, and 112 with wood ; great care and persevering attention were required in the stocking with wood to keep the steam up, and twice the engines were nearly at rest from the steam failing. Admitting that the revolutions of the wheel on the strokes of the piston in the cylinder measure the steam expanded in any given time, the coal would have supplied the cylinder 6960 times.

The wood,...	...	...	...	...	...	5040
Making a difference of	...	...	...	...	...	1920

* Coal has been discovered on both banks of the Indus ; the locality is the salt range, in the parallel of 32° North, deposits extending in a longitudinal direction ; but not in a North and South one. Ten specimens from the West bank procured by Captain Burnes have been analized by Mr. Prinsep, and four of them pronounced to be the purest form of mineral coal. Those forwarded by me, and discovered on the East bank, have not yet been examined.

measures, which at 42 per minute, would have required $45\frac{1}{2}$ minutes longer of the consumption of wood to have completed, which at the rate of $11\frac{1}{4}$ maunds in 240 minutes, would have required $4\frac{1}{4}$ maunds nearly, which added to $11\frac{1}{4}$ would make $15\frac{1}{2}$ maunds of wood to produce the same quantity of steam as $9\frac{1}{2}$ maunds of coal; but it has been seen, that owing to the weakness of the steam provided by the consumption of wood to perform the same distance, required $\frac{22}{120}$, or one-sixth more time nearly, a detention most injurious to the interest of Internal Steam Navigation.

30th October, 1837. (Signed) J. H. JOHNSTON, *Controller.*

IX.—*Of the Inundation.*

Like all other large rivers, the Indus is subject to a periodical increase of its water; during the continuation of which, it inundates a large tract of country. The river rises in March, and falls in September. From Mittun upwards, I have delineated the flooded district upon the chart; but in tracing their boundaries between that district and the sea, I labour under the disadvantage of having to draw my material as much from hearsay as personal observation.

It may in this place be observed, that the valley of the Lower Indus owes its crops entirely to the yearly swell of its river.

The soil of Sind is naturally poor, producing spontaneously the products of the desert; but save within the belt of inundation, neither grain for man or grass for cattle. Even here grass is scanty and coarse; a turf is a thing unknown on the banks of the Indus, and the Islands in the stream below Bukkur are nothing more than naked sand banks. Two consecutive crops exhaust the soil, unless manured. The natives it is true liken it to gold; but the comparison would be more just if applied to the river, the cause of all its fertility. On the banks of the Upper Indus the soil improves, and were such subject not irrelevant to this report, I might proceed to adduce the proof of this assertion, and to investigate the cause of so apparent an anomaly.

In some respects, the annual swelling of the Indus is attended with peculiar phenomena. One year the country on its right bank is so deluged, that towns and villages, though protected by strong dams,

are threatened with inundation; while on the opposite side of the river, there may be found, during the same season, a difficulty of irrigation. In thus distributing its favour, the stream exhibits more of constancy than caprice, for when once it has taken to either of the banks, it adheres for a series of years to the favoured side. Another circumstance merits notice. The Mississippi when in flood, as we learn from Audubon, the talented American ornithologist, inundates the valley to a large extent; at that season the Squatter and a Lumber river canoe pierce the thickest depths of the forest, while flat boats of great burden, and steamers of noble dimensions, are seen moored to stately trees overhanging its banks. The Ganges in the lower part of its course, overflows its banks in a similar manner to the Mississippi. During the S. W., or rainy monsoon, when the former river is in flood, the whole of its Sunderbunds, or Delta lands are, according to Rennel, submerged. With the Indus it is different. Inundation here is more often partial than general, and at the height of its freshes, the Persian wheel may be seen watering fields on the verge of its banks. The *Kurreef* and *Rubbee* (Autumn and Spring) harvest affords the most conclusive evidence in this case. The crops of the first are produced from an irrigated, and those of the latter from an inundated, soil; while the weight of the *Kurreef* harvest is to that of the *Rubbee* nearly as two to one.

On inspecting the accompanying chart of the Upper Indus, it will be seen that the river has double banks, or inner and outer ones. The first of these is as changeable as the navigable channels of the Indus, the latter as permanent as the river's course; the inner banks from its bed in the cold season, when the water is low and permanent, hem in the floods and freshes of an opposite season. The following Table will further illustrate this interesting feature of the Indus, though I believe it is one common to all rivers flowing through plains:—

Outer and inner Banks of the Indus.

<i>Parallel of Latitude.</i>	<i>Dry season Surface Water.</i>	<i>Width of the Dry flat.</i>	<i>River's Bed. Surface Water in the freshes.</i>
26° 28' N.	1456 yards.	788 yards.	2244 yards.
26° 44'	658 do	1560 do	2218 do
27° 18'	850 do	3004 do	3854 do

The double banks accompany the Indus after it has left the mountains at Kalabagh for the remainder of its course. Were the permanent continuous, the inundation would be restricted to narrow and defined limits; but as this is not the case, I will endeavour to point where this barrier is broken or wanting.

From Attock to Kalabagh.—No inundation.

From Kalabagh to Mittun.—It may be generally remarked, that in the northern part of the Upper Indus, there is no inundation, while in the south, or lower part of its course, the flooded districts are of a considerable extent, as a reference to the chart will shew.

Mittun to Bukkur.—Neither on the east or west banks of this division is there an outer bank, and the consequence is, that the country here is largely inundated. In the Mozarry districts, the floods of 1837 fell twenty miles back from the river; but in ordinary seasons twelve is the more usual measure of their width. On the opposite bank, the inundation about Subzalkote reaches to the edge of the desert.

Bukkur to Sehewan.—Though the permanent banks may be traced in this section, their outline is broken, and the low districts behind them overflowed in the freshes. South of Sehewan inundation of the west bank is general, though the quantity of uncovered land exceeds that submerged. Chandkote, the most valuable province in Sind, is situated here, and its exuberant crops are to be attributed to its great command of water. Upon the opposite bank, between the river and the desert, is a strip of alluvium, the medial width of which is four miles. This belt marks the extent of the flooded districts; but for some years past, there has been scarce any inundation upon this side of the river.

Sehewan to efflux of Fulailee.—The Tela mountains for some distance below Sehewan prevent the river from expending in a westerly direction, and a creeping hilly ridge serves the same purpose further South. On this side of the river, the inundation is confined to a very narrow belt; on the opposite side the desert opposes any outlet to the East, and here, though the inundated belt be wider than that upon the West bank, its breadth cannot be estimated at more than three miles.

Efflux of Fulailee to the Sea.—The Delta of the Indus may be said to commence from the efflux of Fulailee. The lower portion

of it only is under water, and the inundation here as in the upper course of the river is partial; the submerged part is a belt fringing the sea, measuring in width about twenty miles.*

X.—*Fords of the Indus.*

There are properly speaking no fords on the Indus below Attock, that is, there is no spot in its course where their annual occurrence is so certain as to warrant a dependence on their existence in any subsequent military operations, of which the banks of this river may become the scene.

But that the Indus is at times fordable is certain, and in the course of my inquiries on the subject, I have met with many individuals who assured me of having done it. What may be done once, may be performed a second time, and when a solitary unassisted *Moohaud* can cross, it is just as possible that a regiment of infantry may follow. A ford open to a foot soldier, would prevent no difficulty to horse. The practicability of fording the river being once admitted, becomes a subject of importance, and viewing it in this light, I shall devote more space than I otherwise should to its consideration.

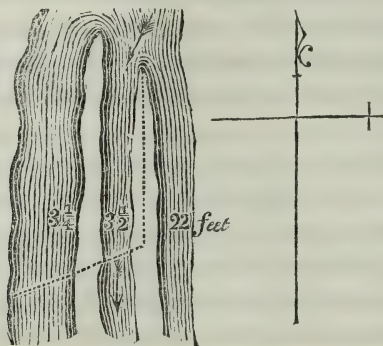
The months in which the river is fordable, are December, January, February, and March. No instance is on record of its having been done either north of Mittun, or south of Hyderabad in Sindh. The Indus does not within the excluded track run deeper than in that portion of its course where the river is known to be fordable; but being less frequented by the boatmen, its capabilities are not so generally known.

The fords are discovered by the annual fleet of grain boats, which descend in the cold weather from the Upper Provinces to Lower Sindh. Some boats in this fleet are of so large a draft, that their safe navigation calls for the most minute survey of the river's channels, and it is whilst so employed that the boatmen sometimes find they have crossed, almost unknown to themselves, from one bank of the river to the opposite, without once having had to swim.

* These observations on the inundation of the Indus south of Mittun are given with much deference, as I have not had proper opportunity of inquiry. This does not apply to any remarks on this subject above Mittun.

During the dry season of 1836-37, I had frequent intimation of fords; but was not fortunate enough personally to discover one, for it so happened, that by the time I had got to the spot, they had always disappeared. The following sketch is taken from a trust-worthy person, whom I had sent to report on a suspected locality:—

Ford in the neighbourhood of Halá.



The centre channel is here the continuous one; that on the east side was however the deepest, and discharged the most water; but its mouths were closed up by shoals. Forty-two boats were lying above the ford, waiting for the channel to open; this was on the 27th February. The dotted line shews the ford. On this subject I am glad to have the testimony of Dr. Gordon, the officer who went from Loodiana to Bombay with the Maharajah's (Runjeet Sing) mercantile speculation. He tells me, that some distance north of Hyderabad, he came upon a shoal stretching completely across the river, when many grain boats unable to pass over it, were lightening their draft by transporting a portion of their cargo into smaller boats. Dr. Gordon finding more water above the shoal than the boats in his charge drew, held on his course.

The custom of bridging the Indus by boats at Attock, has prevailed since the days of the Greek invasion, and it appears to me, that the same might be used with equal success to cross an army much lower down the river.

The place most adapted for this purpose, whether viewed merely with reference to the river itself, or to the Afghan Passes that lead down upon it, and which have not been unaptly termed the gates of Khorassan, is Bukkur fort. Here we have a permanent channel, both

banks of the river being faced with hard flint hillocks, while in the middle of the stream are some islets of the same material, on one of which is the ford, and contiguous to it, or rather adjoining it, another, containing the tomb of Peer Khaja Khizr. At no other spot below the mountains, does the Indus present similar facilities for bridging. The channel here is as follows :—

Above the fortress the river widens to..... 1244 yards.

In a line with the fort it is less, say 1000 do.

The channel between the fort and the west ———

bank of the river, is by measurement..... 98 do.

Ditto ditto on the opposite side of the fortress,

estimated 400 do.

Width of fortress and Isle of Khaja Khizr, 502 do.

1000 do.

Depth of the Channels.

West Channel 98 yards measurement.

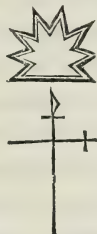
Current 2.9 knots.

5,6,7,9,12,15,9,3 feet.

East Channel 400 yards ; estimated

Current 3.7 knots.

7,7,9,9,9,12,12,13,15,18,30,24,12ft.



A spit projects from the north-west end of the fortress, and extends to within fifty yards of the west bank. In this gut the current is four knots an hour, the depths were 6 6 7 7 6 6 6 5 5 feet ; at the time these measurements were made, the river had 12 feet more to rise. In fact it was when at its lowest level.

Last June I had an opportunity of examining this bridge of boats at Attock, it contained thirty-six boats, and the river, when they were moored, had a width of 540 feet, its depth by measurement taken the preceding year was 10 fathoms, and the current about 6 knots an hour. By comparing this account of the Attock bridge, with the details of the river at Bukkur, it is evident that circumstances are greatly in favour of the former ; but surely, if a few untutored boatmen succeed so well at one place, we ought not to despair of our success at Bukkur.

The chief, in fact the only difficulty is, mooring the boats, and to effect this, the Seiks use an anchor of a form the very worst that could be imagined, and which has no other recommendation than its antiquity, and perhaps the ease with which it can be dropped from the boats. The figure is pyramidical, a skeleton of wood filled with stones. These uncouth things, when once let go, cannot be recovered, and as the strength of the bridge is not proof against that of the current in June, July, August, and September, a new set has to be made as often as the bridge is required to be constructed. Now were a line of mooring anchors once laid down in place of these wooden baskets, and beyond chain bridles attached to them, a bridge of boats could be put together in about as many hours, as days and weeks are now consume in preparations.

The number of boats required to form a bridge, would be built of a form the best that science could propose, and always kept in a state of readiness to haul out to their several berths, numbered as the buoys would be, 1, 2, 3, &c. A bridge so formed, would be a very solid construction, and able to brave, under proper superintendence, the strongest freshes in the Indus, whether abreast of Attock or under the fort at Bukkur. Should it become necessary to destroy it, one end of the bridle chain has only to be slipped and the mooring anchors are useless to an enemy. But little weight is due to the opinion of men, who not conversant with military affairs, cannot be expected to have clear ideas on such a subject. But still I venture to hold the opinion, that bridging the Indus at Bukkur, is a practicable question.*

The difficulty would be to moor boats in the eastern channel; but this once accomplished, the bridge might be made permanent, as the small western channel might serve for the navigation of the river.

XI.—Of a Site for a Fair.

While Government has it in contemplation to establish an *entre-pôt* for trade on the banks of the Indus, it will not be irrelative

* I need not observe that this was written before Capt. Thompson (Bengal Engineers) threw his noble bridge across the river, by which the British army crossed in 1838, with their baggage and battering train.

to the subject of this report, briefly to say a few words on the locality of those towns where the mart is likely to be fixed.

This question will perhaps be ultimately decided more by the existing foreign relations of the different towns, at the time when this selection is made, than with reference to their geographical position, or their local site. Shikarpoor has hitherto been excluded from the list of places best adapted, to answer the purpose of Government ; but in the turn which current events may give to the political relations of Afghanistan, that town may yet become one of the *entrepôts* for the trade of Central Asia.*

Shikarpoor is not destitute of collateral advantages. The large money transactions of its bankers; the extent and skilfully organized agency which they have diffused, are known to all interested in these matters; though the advantages of such an establishment can be duly appreciated by merchants themselves. With steamers upon the Indus, the proximity of the town to Bombay, the market for Europe goods is favourable to its site as a mart; and were Bukkur fort in our possessions, the British flag upon that fortress would win confidence by guaranteeing security.

The *Zeearat* of Khaja Khizr, a *peer*, alike worshipped by Mahomedan and Hindoo, adjoins the fort of Bukkur, and on the anniversary of a certain day in April, multitudes of both creeds flock to this shrine. Opposite, in the town of Roree, is a place of pilgrimage of still greater sanctity; for here, say the faithful, is preserved a lock of the prophet's hair.

The distance of Shikarpoor from the river, operates unfavorably to its becoming a commercial mart; it lies eighteen koss inland of its port of Shukur. From May to September inclusive, boats can come up to the town by means of a fine canal, called the Sinde, and were this work deepened and connected with the Larkhana canal or the Noroab canal of the Indus, we should have an inland navigation throughout the year, between Sehewan and Shikarpoor. It would traverse the richest portion of the Sindian territories, and evade an intricate passage of 100 coss upon the main river. So admirably is the country adapted for this means of transit, that

* It is a proof of Lieut. Wood's judgment and sagacity, that his supposition is now in course of fulfilment.

throughout the entire line, not a single loch is necessary, save for occasionally cleaning the canal. The returns would be great, and the outlay very moderate compared to that of similar work in countries where natural obstacles have to be surmounted, and labour is a more valuable commodity than in Sindh.

The country around Shikarpoor is subject to inundation; but west of the town, and contiguous to the suburbs, is a dry plain, where buildings to any extent could be erected.

I do not believe there is a healthy spot on the banks of the Indus; in this respect there is little choice; some towns have ailments peculiar to themselves; but from the day the river begins to fall in September to the end of November, asthma and fever are common, from the mountains at Kalabagh to the sea.

Bukkur fort and Roree are built upon hillocks of flint, which though not high, render both these places more healthy than towns in the plains. The first is a fortified islet amid channel, and Roree overhangs the left bank of the river, with a depth of four fathoms water under the walls. As a *depôt* for military purposes or an *entrepôt* for commerce, much could be written in favour of both these places.

Mittun.—The geographical position of Mittun is superior to that of any town upon the Indus. In addition to commanding of both the Indus and Punjaub streams, it stands midway between the gates (as the natives term them) of Khorassan, namely, the passes of Bolan and Sakhi Surwar, while immediately behind it are the entrances of the former pass by the auxiliary routes of Assui and Hunnund. The town is built upon a small artificial mound, and when the freshes are in the river it is surrounded on three sides by water; it is two miles distant from the Indus, but from the middle of June to the 22d of September, boats can discharge or take in cargo immediately under the town, by means of a fine natural water-course, navigable down the Bangalah and Omerkote. South of Mittun, is a dry plain that fringes the above nullah; and should this town be preferred for the site of a fair,* it is on the bank of this stream that booths and other buildings should be erected. During the inundated months, camels cannot travel north or west of Mittun. The inhabitants prefer well-water to that of the Indus. When

* Since selected for the purpose.



the river has been falling for four or five successive days, to drink the nullah water is almost certain to bring on an attack of illness ; this the natives attribute, and I think very properly, to the vegetable matter which must be brought into the water-course, by the drainings of the inundated districts. Mittun, and the village of Chatchur upon the opposite bank can, taken together, supply forty boats of from one hundred maunds burden to one thousand.

I ought before to have said that cutaneous eruptions trouble the inhabitants of Mittun ; the sores frequently become ulcered, but though difficult to heal, the disease does not appear to affect the general health.

Dera Ghazee Khan.—This town has been more than once endangered by the inundation when Nawab Jubber Khan, the brother of Dost Mahomed Khan of Cabool, was governor of the province ; a wall that surrounded the town had to be thrown down to keep the water out, nor is there within a circle of many miles a spot exempt from its effects. Dera Ghazee Khan is situated about four miles from the river ; but in the swell, like most of the other towns upon the Indus, it has a large navigable canal, by which it may be approached by boats for some months. Dera Ghazee Khan has, however, advantages that it will be difficult to set aside ; the town lies at the foot of a pass in the Soliman mountains, that leads both to Cabool and Candahar, while it is equally central with respect to the Indian routes. It is the largest town upon the Indus, and even under the Sikh rule, it wears an appearance of increasing prosperity. Its merchants, though they do not speculate largely, have an extensive agency, and a considerable command of money. The country around yields heavy crops of grain, and the staples of cotton and indigo, while its home manufactures of silken stuffs, such as gool buddens, timorees, &c. is only equalled by the manufacturing marts of Bhawalpoor and Moulton. When to the above recommendations are added, the fairs at Peer Adul and Sakhi Surwar, I believe that every thing considered, Dera Ghazee Khan, or rather some spot in its vicinity, will at once be considered the most eligible place to lay the foundation-stone of an Indian St. Macrera. By a reference to the map it will be seen, that Sakhi Surwar and Peer Adul, are towns in the district of Dera Ghazee Khan ; at each of these places, a large *Mela*, or fair, is annually kept ; that of Sakhi Surwar

occurs in the Indian month Visukh, answering to our March. It is held in honour of the *peer*, after whom the place is named; the fair lasts five days, and pilgrims from India's furthest shores come to prostrate themselves at the tomb of Sakhi Surwar. Few come from the countries west of the Suliman range; and the followers of Brama out-number those of Mahomed; the aggregate of both cannot be much under 100,000 souls. Though commerce is not neglected, there is but little business done.

A Khorassan or Afghan horse-dealer may now and then exchange an animal of his stud for the productions of India, or the manufacture of Europe; but this *Mela* is essentially an assemblage for devotional and pleasurable purposes; but with such a material, and the example of the holy Mecca, it is easy to fortel that (when the fair is established,) many individuals in this annual concourse of devotees will become as enterprizing merchants as they are now zealous and bigotted *fakeers*. Sakhi Surwar is twenty-four koss nearly direct west of Deera Ghazee Khan; it is a considerable town situated in the mouth of the pass. Firewood is abundant, and a mountain rivulet supplies the town with water. At Peer Adul Zeearat, seven koss in a N. W. direction from Dera Ghazee Khan, a fair is held in February, similar to that of Sakhi Surwar.

Dera Ismail Khan is never inundated from the river, but is yearly flooded by mountain torrents. The present town lies about a mile back from the river, and was built about eight years ago, when the old Dera was washed into the Indus. Dera Ismail Khan is well planned, and when its skeleton streets are filled with occupants, they, for width and cleanness, will match with those of most eastern towns. The houses are of mud or sun-dried brick, terrace roofed, and rise from a ground platform of from one to two feet high. Few are of more than one story. When I passed through it in the middle of summer, the bazar was well frequented; but in the winter months it is much more thronged. The town is a sort of nucleus or rallying point for those pastoral tribes of Affghanistan, who prefer a clement winter in the valley of the Indus, to the security of that which characterizes that of the mountain districts of their own land. Carriage is thus almost unlimited, as some of the tribes rear camels for no other purpose than to put them out to hire. The *Lohanas*, who from before the time of Baber

have been the great carriers and traffickers of these countries, still frequent Dera Ismail Khan. The transit trade of India and Affghanistan is already fixed here, and if the routes radiating from the town are considered merely in reference to Cabool, then is Dera Ismail Khan better situated for a commercial mart than towns lower down the river.

These are all the places that present themselves as eligible spots for the establishment of commercial *depôts* west of the Indus; but should it ever become an object to Government to have the mart within their own frontier, then Leia, upon the Indian bank of the river, lying between the two Deras, is its proper site.

But to give full effect to these fairs, it is desirable that two be established, one for the lower Indus and one for the upper; the latter will supply, besides the markets of Affghanistan, those of Central Asia beyond the Parapamisan chain. The other, by the roads of Kandahar* and Kelat,* will draw from Beloochistan, the districts around Herat, and the southern provinces of Persia, their staples of wool, assafoetida, and madder; while in return, it can supply the whole of this extensive region with the growth of India and manufactures of the British Isles, at a cheaper rate than can be done by any other route. Thus, should a general war in Europe exclude England from the Black Sea, an outlet equally good for the staples of her trade is offered by the Indus, with an *entrepôt* at Bukkur and another in the Derajat.

XII.—*Indus and Punjaub Rivers.*

Travelling over the Punjab, in a westerly direction, when its rivers are in flood a little above the parallel of Kalabagh, no less than five streams are crossed, each occupying a larger bed, and seeming to the eye, a more important river than the Indus.

The Punjab rivers, as are well known, fall into the Indus in one stream, and if we call our attention to the confluence of the united volume with the latter, the result is strikingly at variance with appearances and pre-formed opinions.

* The port of Sommeeanee seems by recent accounts to be most favoured by importers, and I understand that merchants are only awaiting the pacification of the country, to commence carrying thence, *via* Biela and Kelat.

About the middle of May, I examined both when the relative size of the Indus and its Indian feeds stood as follows :—

<i>Indus, or Sinde.</i>	<i>Chenaub, or Punjaub.</i>
Width 608 yards, max. current 4.8 knots, $\frac{3}{4}$.1.1.1.1.1. $\frac{1}{4}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{3}{4}$. 2.2.2 $\frac{1}{4}$.2 $\frac{1}{4}$.2 $\frac{1}{2}$.2 $\frac{1}{2}$.2 $\frac{1}{2}$.2 $\frac{1}{2}$.2 $\frac{1}{4}$.2.2 $\frac{1}{2}$.2. 1 $\frac{1}{4}$.1. $\frac{3}{4}$.1 $\frac{1}{2}$. $\frac{1}{2}$ fathoms. Discharge per second 91.719 cubic feet.	Width 1766 yards, current 1.8 knots, 2 $\frac{1}{2}$.2.2.1 $\frac{3}{4}$ 1 $\frac{1}{2}$ 1 $\frac{3}{4}$.1 $\frac{1}{2}$ 2.1 $\frac{1}{2}$ 2 $\frac{1}{2}$.1. 1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{3}{4}$.2.2.2 $\frac{1}{4}$.2.1 $\frac{1}{2}$.2.2. $\frac{1}{4}$.2.1 $\frac{1}{2}$.2. 2 $\frac{1}{4}$.2 $\frac{1}{2}$.1 $\frac{1}{2}$ 1 $\frac{3}{4}$ 2 $\frac{1}{2}$ 2 $\frac{1}{4}$ fathoms. Dis- charge per second 68.955 cubic feet.

Here the principal cause of the disproportionate size of the Indus is the early commencement of its freshes. Indebted for its periodical rise principally, if not solely, to snow-clad mountains, an increase is first perceived in its stream when the sun comes into our northern latitudes at the vernal equinox in March; but the Punjaub rivers depending upon theirs upon another and less constant source, namely, the rainy season of Hindostan, have their freshes later. At the time of my examination in May, the Sutlej, the most eastern of the Punjab rivers, was at its lowest level; while the Jalum, the most western of the five rivers, and the one which has its source nearest to that of the Indus, had already shewn signs of rising; from which I am inclined to think, that measurements made in July would give, if not an entirely different, a less disproportionate result in the amount of water discharged by the Indus and its Punjaub auxiliaries.

But that the Indus is a superior river to the Punjaub, seems very clear; and amongst the collateral proofs of this which may be urged, is the direct nature of its course, compared with those of the Punjaub streams. Also the dread in which the river is viewed by the *Mohanas*, who, were the choice left to themselves, would prefer dragging their boats twenty coss up the Chenaub, to half that distance upon the Sinde.

Another circumstance connected with these two rivers is worthy of notice; in the Doab, or country lying between them, all canals are cut from the Sinde, in the month of July, when both rivers are in the flood, the surplus water of the Sinde pours down into the Chenaub, proving that though their beds for a distance of sixty miles are not more than ten miles asunder, yet that in their relative level, there is a considerable difference.

It appears to me, that Captain Burnes must have erred in giving so large a fall as twelve inches a mile to the Punjaub streams, and but half that quantity to the Indus. In the dry weather, the latter river has most decidedly a much stronger current, than any of these streams, and even in the freshes, their current as far as I have been able to observe the Punjaub rivers, is not so strong as that of the Indus. On the 27th of June this year, the current of the Roree at Lahore was not more than three knots an hour, and neither that of the Jalum or Chenaub exceed four.

XIII.—*Concluding Remarks.*

It has been matter of regret, that so noble a river as the Indus, should have no port accessible to vessels of burden.

The disappointment is, however, more imaginary than real. If indeed the merchant is necessitated to employ ships of 4 and 500 tons burden, such a class of vessels cannot enter the river, and he must land his goods at Curachee, the only port in Sind open to vessels of this description; but if, on the contrary, he prefer water carriage to land portage, why not avail himself of tonnage? In the fair season, hundreds of boats frequent the mouths of the Indus; they are the common coasting vessels of Cutch, and none of them exceed, when laden, a draft of nine feet. The average draft is six and seven. I believe that the principal mouth, namely, one that discharges the greatest body of water, will even be found the least navigable, and that the port of the Indus, though it may fluctuate between the Luckput creek and Curachee, will always be situated in a secondary branch, discharging little or no fresh water, but connected with the main stream by a creek or navigable channel, open only to the flat boats of the river. But even admitting that a vessel drawing seven feet water could get upon the main trunk, nothing would be gained, as no other description of vessel but the light drafted steamer already noticed, will be found to answer upon the Indus, and such vessels will be able also to keep up the communication between the sea-going craft and the main river. If then a portage is thus shewn to be unnecessary merely to give free access to the river, it is equally useless by way of avoiding the difficulties of navigation in any

particular part of its course. In my former report, I did indeed advocate the plan, but I did so then from hearsay. Now I give the result of my own observation. The navigation of the Delta is certainly intricate; but the difficulties are not so insurmountable to render a portage desirable, nor does the river improve so much above it, as I was at the time given to understand.

In one respect, the authorities on the river have it in their power to confer a considerable boon on the navigation of the Lower Indus. The only obstacle in the river, from which danger is to be apprehended, and which no attention can effectually guard against, is sunken trees. Now the river brings down none of these from the mountains. All come from the *shikargah*, or hunting preserves of the Sindh Ameer. The supply might be cut off without material injury to these forests, or interfering with their Highnesses' amusements. Let the Ameer but give an order, that between the *shikargah* and the river, a clear belt of twelve yards wide be left, and in a few weeks their numerous foresters will have cut down a twelve months' fuel for our steamers, and insure a path for the trackers.

As these forests do not extend north of Sehewan, the operation would not require to be carried above that town, the jungle wood there being too small to affect the channels of the river.

TABLE No. I.

Comparison of Chronometers.

Date.	Chronometers.		Differences.	
	No. 256.	No. 257.	1st.	2nd.
1836.				
Dec. 27th	4 18 00	4 31 05	13 "05	2.0
28th	4 13 30	4 26 37	13 "07	2.0
29th	4 26 50	4 39 58.5	13 "08.5	1.5
30th	4 11 15	4 24 25.5	13 10.5	2.0
1837.				
Jan. 1st	4 12 35	4 25 49	13 14	1.7
2nd	4 36 05	4 49 21	13 16	2.0
10th	4 45 35	4 58 06.5	13 31.5	1.9
11th	4 42 35	4 56 08.5	13 33.5	2.0
12th	4 48 20	5 01 55.5	13 35.5	2.0
Feb. 15th	11 51 35	12 06 23.5	14 48.5	2.0
20th	11 18 30	11 34 31.0	15 01.0	2.5
26th	10 49 15	11 04 28.5	15 13.5	2.1
March. 1st	10 48 00	11 03 19	15 19	1.8
5th	11 09 50	11 25 16	15 26.0	1.9
9th	4 38 00	4 53 32.5	15 32.5	1.8
April 9th	4 18 30	4 34 59	16 29	0
14th	4 02 21.5	4 19 00	16 38.5	1.9
17th	4 24 14.5	4 41 00	16 45.5	2.3
18th	4 00 12	4 17 00	16 48	2.5
19th	3 49 10	4 06 00	16 50	2.0
20th	3 54 37.5	4 11 30	16 52.5	2.5
27th	3 34 49	3 52 00	17 11.0	2.6
29th	4 00 14	4 17 30	17 16	2.5
May 19th	3 35 56	3 54 00	18 04	2.4
20th	2 51 53.5	3 10 00	18 06.5	2.5
1838.				
July 16th	9 59 00	5 47 07.5	4 11 52.5	3.5
17th	8 03 00	3 51 05	4 11 55	2.5
18th	9 56 58	5 45 00	4 11 58	3.0
19th	9 43 00	5 30 59	4 12 01	3.0
20th	7 43 00	3 30 56	4 12 04	3.0

TABLE No. 2.

From Mittun to Dera Ghazee Khan. The Time-keepers were examined at Mittun, and again at Dera Ghazee Khan. The following Table shews the result of each rate, while for the Longitude it gives a Mean of both.*

Stations.	Latitudes.	Diff. Longitude by		Mean.	Longitude.
		Mittunkote.	Dera Ghazee Khan.		
No. 1	28°58'25" N.				
2	29°04'38"	03°57'	04°21'	04°9'	70°30'34" E.
3	29°04'49"	10°45'	11°10'	10°37'	37°22'
4	29°23'44"	12°54'	13°31'	13°12'	39°37'
5	29°31'53"	25°36'	26°20'	25°58'	52°23'
6	29°42'00"	25°15'	26°01'	25°38'	52°3'
7	29°53'00"	28°34'	29°20'	28°57'	55°22'†
8	30°06'02"	27°34'	28°04'	28°4'	54°29'

Dera Ghazee to Dera Ismail Khan. The Watches were examined at these places, and the following Table gives the Longitude of the intermediate stations, deduced from a Mean of the old and new rates.

Stations.	Latitudes.	Diff. of Longitude by rates.			Longitude.
		Old.	New.	Mean.	
No. 1	30°33'19"	02°00' E.	01°51' E.	01°55' E.	70°56'24" E.
2	30°56'49"	01°00' W.	01°18' W.	01°09' W.	70°53'20"
3	31°09'09"	01°10' E.	00°39' E.	00°52' E.	70°55'24"
4	31°24'55"	04°42'	04°24'	04°33'	70°59'02"
5	31°37'16"	09°57'	09°21'	09°39'	71°04'08"
6	31°42'30"	05°03'	04°24'	04°43'	70°59'12"
7	31°47'54"	06°30'	05°50'	06°10'	71°00'39"

* Mittun was fixed from Roree.

† Indifferent.

TABLES,

In which the Geographical position of points and places in the line of the Indus, as they stand in the published Maps, are compared with the Observations of the present Mission.

No. 3.

From the Sea to Mittun.

Places.	Latitude.		Longitude.	
	Map.	Mission.	Map.	Mission.
	° ' "	° ' "	° ' "	° ' "
Barree Gorah, ...	24°12'00 N.	24°13'20 N.	67°54'30 E.	67°36'00 E.
Efflux Hejamree,	24.08.42	24°16'42	67°57'00	67°47'03
Tatta Bunder, ...	24°44'00	24°44'30	68°19'00	68°01'06
Hydrabad do. ...	25°22'00	25°22'04	68°41'00	68°23'03
Sehewan do.	26°22'00	26°22'35	68°09'00	67°55'17
Roree do.	27°43'29	27°41'59	68°56'00	68°55'39
Chatchur do.	28°53'29	28°52'07	70°31'00	70°27'57
Mittun do.	28°54'00	28°53'19	70°29'00	70°26'25

No. 4.

Mittun to Attock.

Places.	Latitude.		Longitude.	
	Map.	Mission.	Map.	Mission.
	° ' "	° ' "	° ' "	° ' "
Nowshaira,	29°11'00 N.	29°12'19 N.	70°38'00 E.	70°35'28 E.
Raick,	29°21'00	29°24'20	70°45'00	70°39'01
Sherroo,	29°42'00	29°42'00	70°58'00	70°50'03
Dera Ghazee				
Khan,	29°58'00	30°03'26	71°00'00	71°51'23
Dera Dean				
Pemah,*	30°40'00	30°33'19	71°06'00	71°00'24
Ditto,†	30°51'30	30°39'20	70°57'30	
Leia,	31°08'00	30°58'01	71°05'00	70°59'23
Rajun,	31°14'00	31°08'39	71°06'00	70°57'42
Khahree,	31°30'00	31°24'25	71°01'00	70°54'02
Bukkur,	31°44'00	31°37'16	71°14'00	71°06'28
Dera Ismail Khan,	31°57'00	31°48'39	71°07'00	70°59'30
Kalabag,	33°07'00	32°57'36	71°49'00	71°35'23
Confluence of				
Sehewan,	33°10'00	33°01'48		
Attock,	33°55'40	33°53'53	72°27'00	72°16'27

* East bank.

† West bank.

TABLE No. 5.

Sectional or Cross River Soundings. 1st, in the Delta in the months of December and January.

Parallel of Latitude.	Soundings.	Widths.
24° 17' N.	5.6.7.6.5 $\frac{1}{2}$.5.4 $\frac{1}{2}$.4.4.3.2.2.2.1 $\frac{3}{4}$.1 $\frac{1}{2}$.1.1 $\frac{1}{2}$ fathoms....	
19	$\frac{1}{4}$.2.3 $\frac{1}{2}$. 4.4 $\frac{1}{2}$. 6.5 $\frac{1}{2}$.5 $\frac{1}{2}$.6. 4.3 $\frac{1}{2}$.3 $\frac{1}{2}$.3.3.2 $\frac{1}{2}$.2 $\frac{1}{2}$.2 $\frac{1}{4}$.2.2. 2.2.2 $\frac{1}{2}$	734 yds.
21	1 $\frac{1}{2}$.1 $\frac{1}{2}$.2.3.3 $\frac{1}{2}$.3 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.2.2.3.2 $\frac{1}{2}$.2 $\frac{1}{2}$.2 $\frac{1}{2}$.1.2.2 $\frac{1}{2}$.2. ...	631
26	1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$. 1.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{3}{4}$. 1 $\frac{3}{4}$.1 $\frac{3}{4}$.1 $\frac{3}{4}$.1 $\frac{3}{4}$.1 $\frac{3}{4}$.1 $\frac{3}{4}$.1 $\frac{1}{2}$	455
28	1.1.1.1 $\frac{1}{4}$.1 $\frac{1}{2}$.1 $\frac{1}{4}$.2.2 $\frac{1}{4}$.2.2.2.2.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1.1 $\frac{1}{2}$	1277
34	$\frac{3}{4}$. $\frac{3}{4}$. $\frac{3}{4}$. $\frac{3}{4}$. 1.1 $\frac{1}{4}$.1 $\frac{1}{4}$. 1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{4}$. 1 $\frac{1}{4}$. 1 $\frac{1}{2}$.1 $\frac{3}{4}$. 2.2.2.2 $\frac{1}{4}$.2 $\frac{1}{4}$. 2 $\frac{1}{4}$.2 $\frac{1}{4}$.1.1.1 $\frac{1}{2}$. $\frac{1}{2}$	
37	1.1.1.1. 1.1 $\frac{1}{4}$. 1 $\frac{1}{4}$.1 $\frac{1}{4}$. 1 $\frac{1}{4}$.1 $\frac{1}{4}$.1.1.1.1 $\frac{1}{4}$.1 $\frac{1}{2}$.1.1.1.1.1 $\frac{1}{4}$. 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1 $\frac{3}{4}$. $\frac{3}{4}$. $\frac{1}{2}$. $\frac{1}{2}$	841
44	1.1.1. $\frac{1}{2}$.3.3.3.4 $\frac{1}{2}$.3 $\frac{1}{2}$.3.2.1 $\frac{1}{2}$.1.1.1.1.1 $\frac{3}{4}$. $\frac{3}{4}$. $\frac{1}{2}$	691
47	$\frac{1}{4}$. $\frac{1}{2}$.1 $\frac{1}{4}$. $\frac{1}{4}$.1 $\frac{1}{2}$.1 $\frac{3}{4}$.1.1 $\frac{1}{2}$.2.3.3 $\frac{1}{2}$.3 $\frac{1}{2}$.3 $\frac{1}{2}$.3. ...	
48	$\frac{1}{2}$.1.1 $\frac{1}{2}$. $\frac{1}{2}$. 2.2 $\frac{1}{4}$.4. 1.1.1.3.3.3.3.3 $\frac{1}{2}$. 3 $\frac{1}{2}$.2 $\frac{1}{2}$.2.1 $\frac{3}{4}$.1.1. 1. $\frac{1}{2}$. 1007 dry. 1.1.1.1. $\frac{1}{2}$	1132
50	1.2.2 $\frac{1}{2}$.2.2.1 $\frac{1}{2}$.1 $\frac{1}{2}$. 1.2.2.1 $\frac{1}{4}$.2.2.2.1 $\frac{3}{4}$.1 $\frac{1}{2}$. 1 $\frac{1}{2}$.2.1.1.1. 1 $\frac{1}{4}$.2. $\frac{3}{4}$	

Between the Delta and Schewan, in the months of January and February.

Parallel of Latitude.	Soundings.	Widths.
54	1.1. 1 $\frac{1}{4}$.1 $\frac{3}{4}$.2.1 $\frac{1}{2}$.1.1.1.1 $\frac{1}{4}$. 1.1 $\frac{1}{4}$.1 $\frac{1}{4}$. 1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$.1 $\frac{1}{2}$. 1 $\frac{3}{4}$.2.1 $\frac{1}{2}$.1.	780 yds.
58	1.1.1 $\frac{1}{2}$. 1 $\frac{3}{4}$. 2.2. 2. 2. 2.2.1 $\frac{1}{4}$. 1. $\frac{3}{4}$. $\frac{3}{4}$. $\frac{3}{4}$. $\frac{3}{4}$. $\frac{3}{4}$. 1. $\frac{3}{4}$. 1.1 $\frac{1}{4}$.1.1.1.2.1 $\frac{3}{4}$.1 $\frac{1}{4}$.1 $\frac{1}{4}$. $\frac{3}{4}$. $\frac{1}{2}$	978





Between the Delta and Sehewan, in the months of January and February.—(continued.)

Parallel of Latitude.	Soundings.	Widths.
25° 00'	$\frac{3}{4}.\frac{1}{2}.\frac{1}{2}.1.1.\frac{1}{4}.1\frac{1}{2}.2.2\frac{1}{2}.2.1\frac{1}{2}.1\frac{1}{4}.1. \dots \dots \dots$	834 yds.
13	$1\frac{1}{2}.1\frac{1}{2}.3.3.2\frac{1}{2}.2.1\frac{3}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1.1. \dots \dots$	590
19	$3.3\frac{1}{2}.3\frac{1}{2}.3\frac{1}{2}.3.3.2\frac{1}{4}.1\frac{1}{2}.1\frac{1}{4}.1.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}. \dots \dots$	400
22	$\frac{3}{4}.1\frac{1}{4}.1.1.1.1\frac{1}{4}.1.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1.1.1.1.1.1\frac{3}{4}.\frac{3}{4}.1.1\frac{1}{2}.$ $1\frac{3}{4}.1\frac{3}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1.1\frac{3}{4}.\odot.1\frac{1}{2}.2\frac{1}{2}.2. \dots \dots$	—
25	$4\frac{1}{2}.3\frac{3}{4}.1\frac{1}{2}.2\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1. \dots \dots \dots$	518
31	$1.1\frac{1}{2}.1\frac{3}{4}.1\frac{1}{2}.1\frac{1}{4}.1.1.1\frac{1}{4}.1\frac{3}{4}.1\frac{1}{2}.1\frac{3}{4}.1\frac{3}{4}.1\frac{1}{2}.1\frac{3}{4}.\frac{1}{2}. \dots$	460
35	$\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{3}{4}.\frac{3}{4}.1.1.1.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{3}{4}.2\frac{1}{2}.2\frac{3}{4}. \dots \dots$	700
26° 00'	$1.1\frac{1}{2}.1\frac{3}{4}.2.2\frac{1}{4}.2.2.2.1\frac{3}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{4}.1. \dots$	522
11	$1.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1.1.1.1\frac{1}{2}.1.2.1\frac{1}{2}.1\frac{1}{2}.2.2.2.1\frac{1}{2}.1\frac{1}{4}.\frac{1}{4}. \dots$	600
16	$3.4.4\frac{1}{4}.4\frac{1}{4}.3\frac{1}{2}.2\frac{1}{2}.2.\frac{3}{4}.\frac{3}{4}.\frac{3}{4}.1.1.1.1\frac{1}{2}.1\frac{1}{2}.2.2\frac{1}{2}.2\frac{1}{2}.2\frac{3}{4}.1.1.$ $1.1.\frac{3}{4}.\frac{3}{4}.\frac{3}{4}.\frac{3}{4}.\frac{3}{4}.1.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.2.2.1\frac{1}{2}. \dots \dots$	1000



Between Sehewan and Bukkur, in the months of February and March.

Parallel of Latitude.	Soundings.	Widths.
24,	$\frac{5}{4}.\frac{5}{4}.\frac{5}{4}.1.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{5}{4}.1\frac{5}{4}.$ $1\frac{5}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1.1\frac{3}{4}.\frac{1}{2}.\odot.\frac{1}{2}.\frac{1}{2}.$ $\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{5}{4}.\frac{5}{4}.\frac{5}{4}.\frac{5}{4}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\odot.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.1.1\frac{1}{2}.1\frac{1}{4}.2\frac{1}{4}.$ $2\frac{1}{2}.2\frac{1}{2}. \dots \dots \dots$	1684 yds
28	$\frac{1}{2}.\frac{5}{4}.\frac{5}{4}.\frac{1}{2}.\frac{5}{4}.\frac{5}{4}.1.1.1.\frac{5}{4}.\frac{5}{4}.\frac{5}{4}.1.1.1.1.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.\frac{5}{4}.\frac{5}{4}.$ $1.1.\frac{5}{4}.1\frac{1}{2}.\frac{1}{2}.\frac{1}{4}.\frac{5}{4}.1\frac{1}{2}.2\frac{1}{4}.2\frac{1}{4}.1\frac{1}{2}.\frac{1}{4}.\frac{1}{2}.\frac{1}{2}.\frac{5}{4}.\frac{5}{4}.\frac{1}{2}.1.$ $1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{4}.1.\frac{5}{4}.\frac{5}{4}.\frac{1}{4}. \dots \dots \dots$	1456
41	$2.2.2\frac{1}{4}.3\frac{1}{4}.2\frac{1}{2}.2\frac{1}{2}.1\frac{1}{2}.2.2.2.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.\frac{5}{4}.\frac{5}{4}.\frac{5}{4}.$ $1.1.1\frac{1}{4}.\frac{5}{4}.\frac{5}{4}.\frac{5}{4}.1.1.1.\frac{5}{4}.1.1.\frac{5}{4}. \dots \dots \dots$	763

Between Sehewan and Bukhur, in the months of February and March.—(continued.)

Parallel of Latitude.	Soundings.	Width.
42'	1. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{5}{4}$.  $\frac{5}{4}$. $\frac{5}{4}$. $\frac{5}{4}$. $\frac{5}{4}$. 1. 1. 1. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{2}$. $\frac{1}{2}$.  $\frac{1}{2}$. $\frac{1}{2}$.  $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$.  $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $1\frac{1}{4}$. $2\frac{1}{2}$. $2\frac{1}{2}$. $2\frac{1}{2}$. $2\frac{1}{2}$. $2\frac{1}{2}$. $2\frac{1}{2}$. $2\frac{1}{2}$. 2. 3. 2. $2\frac{1}{4}$. 2. $2\frac{1}{2}$. $1\frac{5}{4}$. $1\frac{5}{4}$. $1\frac{1}{2}$. 1. ...	1600 yds.
44'	$\frac{1}{2}$. $\frac{1}{2}$. $1\frac{1}{4}$. $1\frac{1}{4}$. 2. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{2}$. $1\frac{5}{4}$. $1\frac{5}{4}$. 2. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{2}{4}$. 3. 3.	658
45'	$\frac{1}{2}$. 1. 2. 2. 2. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{4}$. 2. 2. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{2}$. $1\frac{5}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{5}{4}$. $1\frac{5}{4}$. $1\frac{5}{4}$. $1\frac{1}{2}$	452
27° 10'	2. 2. 2. 2. 2. 2. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{4}$. 1. 1. 1. $\frac{3}{4}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$	622
18'	$\frac{1}{2}$. $\frac{5}{4}$. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{5}{4}$. 2. $2\frac{1}{2}$. $2\frac{1}{4}$. $2\frac{1}{2}$. 2. $2\frac{1}{2}$. 3. $4\frac{1}{4}$. 4.	850
29'	$1\frac{1}{2}$. $2\frac{5}{4}$. 3. 4. 4. 4. $4\frac{1}{2}$. 4. 3. 3. 3. $2\frac{1}{2}$. $2\frac{1}{2}$. $2\frac{1}{2}$. 2. $1\frac{1}{2}$. $1\frac{1}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$	690
40'	$1\frac{5}{4}$. 2. $2\frac{5}{4}$. $1\frac{1}{2}$. 2. $2\frac{1}{4}$. $1\frac{5}{4}$. $1\frac{5}{4}$. $1\frac{1}{2}$. $1\frac{1}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $\frac{5}{4}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{5}{4}$. $\frac{5}{4}$. $\frac{5}{4}$. 1. $1\frac{1}{4}$. $1\frac{1}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{5}{4}$. $2\frac{5}{4}$. $2\frac{5}{4}$. $2\frac{1}{4}$. 2. $2\frac{5}{4}$. 3. $2\frac{5}{4}$. $2\frac{1}{4}$. 1.	1896

Between Bukhur and Mittun, in the month of April.

Parallel of Latitude.	Soundings.	Widths.
27° 58'	2. $1\frac{1}{4}$. 4. $\frac{1}{2}$. 4. 3. $3\frac{1}{2}$. $3\frac{1}{4}$. 3. $2\frac{1}{4}$. 2. $1\frac{3}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{4}$. $1\frac{1}{4}$. 1. 1. $1\frac{3}{4}$. $\frac{1}{2}$	561 yds.
28° 03'	2. 2. $2\frac{3}{4}$. $3\frac{3}{4}$. $2\frac{3}{4}$. $2\frac{1}{2}$. 2. $1\frac{1}{2}$. 1. $1\frac{3}{4}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{4}$. $\frac{1}{2}$. $\frac{3}{4}$. $1\frac{1}{2}$. $2\frac{2}{4}$. $1\frac{3}{4}$. 2. 2. $1\frac{1}{2}$. $1\frac{1}{4}$. 2. $1\frac{1}{2}$. 1. 1. $1\frac{3}{4}$. $1\frac{1}{2}$. 1. 1. $2\frac{3}{4}$. $2\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{4}$. $1\frac{3}{4}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$.  $\frac{1}{2}$. $\frac{3}{4}$. $\frac{1}{2}$	1067
08'	1.  $\frac{1}{2}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{3}{4}$. $\frac{3}{4}$. 1. 1. 1. $1\frac{1}{4}$. $1\frac{3}{4}$. $1\frac{1}{2}$. $1\frac{1}{4}$. 2. $2\frac{1}{2}$. $2\frac{1}{2}$. $1\frac{3}{4}$. $1\frac{1}{4}$. 1. 1. $\frac{3}{4}$. $\frac{3}{4}$. $\frac{1}{2}$. $\frac{1}{4}$. $\frac{1}{2}$. $\frac{1}{2}$. $\frac{3}{4}$. 1. $1\frac{1}{4}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{1}{2}$. $1\frac{3}{4}$. $1\frac{3}{4}$. 2. 2. 2. 2. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{4}$. $2\frac{1}{4}$. $1\frac{1}{2}$. 1. $1\frac{1}{4}$. 2. $2\frac{1}{4}$. $2\frac{1}{4}$. 3. $3\frac{1}{4}$. 3. ...	1123

Between Bukkur and Mittun, in the month of April.

Parallel of Latitude.	Soundings.	Widths.
15'	$1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{3}{4}.2.2\frac{1}{4}.2\frac{1}{2}.3.2\frac{1}{4}.2.2\frac{1}{4}.2\frac{1}{4}.2.2.2.2\frac{1}{4}.2.2.3.1\frac{3}{4}.$ $1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{4}.1.1\frac{1}{4}.1\frac{1}{2}.1\frac{3}{4}.1\frac{3}{4}.2.2.1\frac{3}{4}.1\frac{3}{4}.1\frac{1}{2}.1\frac{3}{4}.1\frac{3}{4}.1\frac{1}{4}.1\frac{1}{4}.$ $1.1.\frac{3}{4}.1.1.1.1.1.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ 100 yds. $\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{3}{4}.\frac{3}{4}.\frac{3}{4}.1.1\frac{1}{2}.$ $1\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{3}{4}.\frac{3}{4}....$ 1969 yds.	
17	$\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{4}.\frac{1}{4}.\frac{1}{2}.\frac{1}{2}.\frac{3}{4}.\frac{3}{4}.1.1.1.1.1.1.1.1.1.1.$ $1.1.1.1\frac{1}{2}.2\frac{1}{2}.2\frac{3}{4}.3.3\frac{1}{2}.4.4.4\frac{1}{2}.4.4\frac{1}{2}.3\frac{1}{2}.2\frac{1}{2}.1\frac{3}{4}.3.3\frac{1}{4}.4.4.1.$ $1.\frac{3}{4}.\frac{1}{2}.$ 663	
30	$1.1.1.\frac{3}{4}.\frac{3}{4}.1.1.1.1.\frac{3}{4}.\frac{3}{4}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ 100 yds. $\frac{1}{2}.$ $\frac{1}{2}.\frac{3}{4}.1.\frac{1}{4}.1\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ 100 yds. $\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ $1\frac{1}{4}.1\frac{1}{4}.1.1.1\frac{1}{2}.$ $1\frac{1}{4}.1\frac{1}{2}.2\frac{1}{4}.1\frac{1}{4}.1.1.1.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{2}.$ 1685	
36	$1\frac{1}{4}.1.1\frac{3}{4}.2.2.2.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{3}{4}.2\frac{3}{4}.2\frac{3}{4}.2\frac{1}{2}.2\frac{1}{2}.$ $2\frac{1}{4}.2\frac{3}{4}.2\frac{3}{4}.2\frac{1}{2}.2\frac{1}{4}.2\frac{1}{4}.2.2.2.1\frac{3}{4}.1\frac{3}{4}.2.2\frac{1}{4}.2\frac{1}{4}.1\frac{3}{4}.1\frac{1}{2}.1.1.1.$ $\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ 100 yds. $\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ 100 yds. $\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ $\frac{3}{4}.\frac{3}{4}.1.1.1\frac{1}{4}.1\frac{1}{4}.$ $1\frac{3}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{4}.1.1.1.1.$ 100 yds. 1859	
43	$2\frac{1}{4}.2\frac{1}{4}.2\frac{1}{4}.1.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.2.2.2\frac{1}{4}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{4}.2\frac{1}{4}.2.$ $1\frac{3}{4}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{2}.2.2\frac{1}{4}.1.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{3}{4}.2.2.2.1\frac{1}{4}.1.2\frac{3}{4}.2\frac{1}{2}.2\frac{1}{2}.$ $2\frac{1}{4}.1\frac{3}{4}.1\frac{3}{4}.1\frac{1}{4}.\frac{3}{4}.\frac{1}{2}.$ 100 yds. 1323	
52	$\frac{3}{4}.1.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{2}.1\frac{3}{4}.2.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{3}{4}.2.$ $2.2.1\frac{1}{2}.1\frac{1}{4}.1.1.\frac{3}{4}.\frac{3}{4}.\frac{1}{2}.1\frac{1}{4}.\frac{1}{4}.\frac{3}{4}.1.1.1\frac{3}{4}.1.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{2}.1\frac{3}{4}.1\frac{3}{4}.$ $2.2\frac{3}{4}.3\frac{1}{4}.5.6\frac{1}{2}.7.5\frac{1}{2}.4\frac{3}{4}.6.4\frac{3}{4}.4\frac{1}{2}.4\frac{1}{2}.$ 995	

Between Mittun and Kalabagh, in the months of May, June, & July.

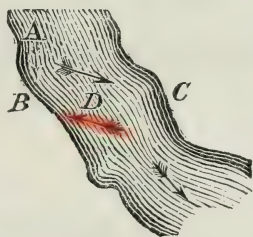
Parallel of Latitude.	Soundings.	Widths.
58'	$\frac{1}{2}.\frac{3}{4}.1.1\frac{3}{4}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{3}{4}.\frac{3}{4}.1.1.1.1.1.1.1.1.1.1.1\frac{1}{2}.1\frac{1}{2}.2.2\frac{1}{4}.2\frac{1}{2}.2\frac{1}{2}.$ $2\frac{3}{4}.2\frac{1}{4}.$ 600 yds.	
29° 04'	$1.1.1.1.1\frac{1}{2}.1\frac{1}{2}.2.1\frac{1}{2}.1\frac{3}{4}.2.2.2.2.2.4.7.2\frac{1}{4}.$ 635	
12	$1.1\frac{3}{4}.2.2.2.2.1\frac{3}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{2}.$ 100 yds. $\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.$ $1.\frac{1}{2}.\frac{3}{4}.1.1.1.1.1.$ $1.1\frac{1}{4}.2.2.2.2.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{2}.2\frac{1}{4}.2.2.1\frac{3}{4}.1\frac{1}{2}.1\frac{1}{2}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{4}.1\frac{1}{2}.1\frac{3}{4}.1\frac{3}{4}.$ 1132	

<i>Current.</i>			miles.	yards.
The usual current in the freshes is,	...	...	5	992
When the freshes are strong,	...	...	6	1272
The greatest measured velocity,	...	...	8	323
Between Attock and Kalabagh, where the river is hem- med in by mountains, it is estimated in the freshes,	...	...	10	
In the dry season usual,	...	...	2	1376
Ditto ditto strong,	...	...	3	1248

In a channel 1855 yards wide, the current in the middle of July has been found to vary its strength in different depths as follows:—

$\frac{1}{2}$ fathom	.....2·7 knots.
$\frac{3}{4}$ do.....	3·4 do.
1 do.....	4·7 do.
$1\frac{1}{2}$ do.....	2·9 do.
2 do.	4·8 do.
$2\frac{1}{4}$ do.....	5·8 do.

By experiments with Massey's patent Log Machine, the ground current of the Indus has been found equal in velocity to that of its surface.



When the stream *A* encounters the bank at *B*, it is thrown off in the direction *C*; that part of the bed called *D* is thus cut off from a further supply. An irregularity in the level is the immediate consequence, to restore which, a surface stream rushes up, as represented by the coloured arrow in the figure; but as the water at the bottom of the surface *D* runs off by the declivity of the river's bed, no equilibrium can take place, while a rotatory motion, fatal to the bank, is given to a large body of water in its immediate vicinity.

TABLE No. 7.

Tonnage upon the Indus.

Boats, ...	Kurwars from									No. of Boats.	Remarks.
		80	70	60	50	40	30	20	10		
Boats, ...	100	90	80	70	60	54	40	30	20		
Doondahs	7	33	47	50	70	70	100	100	150	627	Between the Sea and Bukkur.
Doondahs	0	0	0	0	0	0	0	11	0	11	Bukkur and Mittun.
Tohruks,	0	0	0	0	0	0	60	0	0	60	
Tohruks,	0	0	0	0	0	0	0	107	0	107	Mittun and Kalabagh.
Duggahs,	0	0	0	0	0	0	10	0	0	10	
Duggahs,	0	0	0	0	0	0	0	46	0	46	Kalabagh and Attock.
Total,	7	33	47	50	70	70	170	264	150	861	

Abstract.

Upon the Lower Indus are 627 boats carrying 25,530 Kurwars.

Do. Upper do. 188 do. do. 6,550 do.

Do. Attock, 46 do. do. 1,150 do.

Total, 861 33,230

Deduct for old and worn-out 161 5,635

Boats, 700 carrying 27,595 do.

Available between the Sea and Attock, in which neither fishing craft nor the boats of the Punjab rivers are included.

TABLE No. 8.

Price of Boats at Pind Dadur Khan.

A Tohruk, cedar built, of 100 mds. costs 100 Nanukshakee Rupees.

do.	200	do.	200	225	do.
do.	300	do.	300		do.
do.	400	do.	350		do.
do.	500	do.	450		do.
do.	600	do.	475		do.
do.	700	do.	500		do.
do.	800	do.	500—600		do.
do.	900	do.	600—700		do.
do.	1,000	do.	700—800		do.

TABLE No. 9.

Hire of Boats.

On the Lower Indus Doondahs of 16 Kurwars $1\frac{3}{4}$ Korah Rs. per diem.

do.	do.	35	do.	$3\frac{1}{2}$	do.	do.
do.	do.	40	do.	$3\frac{1}{2}$	do.	do.
do.	do.	38	do.	$3\frac{1}{2}$	do.	do.
do.	do.	60	do.	$4\frac{1}{2}$	do.	do.

On the Upper Indus, Tohruks of 100 mds. at 10 Rs. Goondah per month.

Ditto ditto 700 ditto 60 ditto ditto.

And in the same proportion for Boats of a greater or less burden.

Note.

The Nanukshakee and Bombay Rupee are all equal. Goonda is one anna short of the Nanukshakee.

127 Korah=100 Rupees Bombay.

18 Mamads=1 Kurwar.

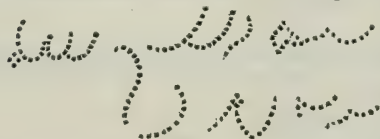
A Sketch of the Second Silver Plate found at Badakshân. By ALEXANDER CUNNINGHAM, Esq.

In the seventh volume of the *Journal of the Asiatic Society*, at page 1047, was published a sketch of an ancient silver plate, obtained by the late Dr. Lord in Badakshân. In a letter to me, enclosing a drawing of a second silver plate, which he had fortunately obtained, he mentioned a fact regarding the first plate which is worth preserving; namely, that it "had been an heir-loom in the family of the Meers of Badakshân, who claim to be the descendants of Alexander the Great; and it had been sold by them in their distress, when they were conquered and imprisoned by Meer Morad Beg of Kunduz, to Atma Ram, his Dêwân Beghi."

Regarding the second plate, I cannot do better than quote Dr. Lord's own words: "I was aware there was a second *patera*, but I failed in all my attempts to get it when I was before in the country. I have now however succeeded; but find, to my astonishment, that its subject is not Grecian, but pure Persian; probably Shápûr killing a lion, as seen in the Persepolitan figures. The *patera* is pure silver; weight 104 kaldâr rupees, (312 drs.) the workmanship of unequal merit; the heads of both man and horse, particularly the latter, appear to me far superior to the other parts; you will notice the peculiar way in which the horse's tail is tied up."

I can add nothing to Dr. Lord's description, except that the original silver plate is 11·2 inches in diameter; and that there is a short inscription of dotted letters on the back of the plates; which appear to me to resemble very closely the Pehlvi characters of the Sassanian coins.

Dotted inscription on the back of Dr. Lord's plate: For the *facsimile* copy of this inscription, I am indebted to the kindness of Lady Sale.



In the four corners of the sketch, I have represented four coins, illustrative of the subject on the silver plate.

No. 2 is the obverse of a silver Sassanian coin, published in the *Journal of the Asiatic Society*, vol. vi. 14, fig. 1, by Mr. Prinsep,

2



3





Original 112 inches in diameter

from his own cabinet. The king's crescent head-dress is the same as that on the silver plate; and the position of the right arm seems to indicate, that it must have pointed a spear towards the indistinct object which is seen between the horse's fore legs, and which is probably the lion of the plate.

No. 3 is the reverse of an early Mahomedan copper coin, published by Mr. James Prinsep, as fig. 2, pl. 14, vol. vi, of his Journal. The obverse has a head and some illegible letters. I have lately procured a similar copper coin, on which the horseman faces to the right; on the obverse is an inscription in ornamental Cufic characters, "*Us sultan ul azem Ala-ud-dunya wa ud din*;" and above the horseman on the reverse are the remains of the letters of the name; and between the horse's legs is the word *بامیان* *Bâmiân*, the place of coinage. I suppose this coin to belong to Ala-ud-din Husên, Ghorî, who was called the Incendiary, after having mercilessly destroyed Ghazni, and put an end to the Ghaznivide dynasty.* The horseman I believe to have been copied from the coins of the Hindu kings of Lahore, of which No. 5 in the lower corner to the right is a silver specimen of Syâlapati Deva.

No. 4, in the left lower corner, is a gold coin of one of the later Guptas, on which the subject is the same as that represented on the plate; the only difference being that on the coin the horseman is using a sword instead of a lance. This coin may date about A. D. 500. The earlier coins of the Gupta family also display the same subject; but on them the lion is attacked by a bowman on foot; and on the reverse, the goddess Lakshmi is seen sitting upon the vanquished animal.

The subject represented on the plate, and on the coins of the Guptas, is then substantially the same; namely, a hero-king overcoming a

* A large hoard of the Indian gold coins of his nephew, the celebrated Mahomed Ghori, the first Mahomedan king of India, has lately been found in the Huzâra country. About one-fourth of the gold coins are of "*Sri-man Kumâra Pala Deva*"—the remaining three-fourths being of Mahomed Ghori. They are highly curious, as proving that the Musulman conqueror was content to have his name only represented on the coinage of the country, without changing the Brahmanical character of the coin. On the obverse is the seated figure of Durga, and on the reverse, in Deva Nagari characters, is the legend, "*Sri Mahajdina Mahamada Sâma*," for Sri Moaz-ad-din Mahumud Sâma.

lion. The Guptas besides, were contemporary with the most flourishing period of the Sassanian monarchy, from A. D. 350 to 500, and even an interchange of presents took place between them and the Sassanian kings; but which however both parties mention as tribute.

But the coincidence of subject on the coins of the Guptas and Sassanians becomes more striking, when we see that the sculptures, gems, and coins of the latter represent the lion being attacked by a hero on foot. A gem published by Ouseley in the *Oriental Collections*, represents the Sassanian king Balash, or Balasces, on horseback, exactly in the same way in which the kings Chandra Gupta and Kumara Gupta Mahendra are represented upon the Indian coins. But the most curious circumstance is, that we can trace this same horseman from his first appearance on the coins of the Bactrian king Mayas,* (whom I confidently hope to be able to identify with Demetrius, the son of Euthydemus,) through the coins of Azas and Azilisas, Undopherras, and Abalgasus, down to the Indo-Parthian king Arsaces; and then through the Sassanian sculptures, gems, and coins, and through the coins of the Hindoo Guptas of Kanoj, and the Pâla family of Lahôr, down through the Mahomedan coinage of the Ghaznivides, and through the Pathan coinage of India, to the time of Mahmud, the cotemporary of Timur; or from B. C. 200 to A. D. 1400, for a period of 1600 years. All this I undertake to make good, when I shall publish my account of the native coinages of India.

ALEXANDER CUNNINGHAM.

Lucknow, 25th June, 1841.

* I beg to refer my readers to a paper in No. 96 of the Asiatic Society's Journal, in which the identification of Mayas with Demetrius was first maintained in opposition to the theory of Mons. Raoul-Rochette, and others. My friend Lieut. Cunningham has, I am gratified to find, adopted my views, as stated in the paper above noted; views however which he is infinitely better qualified than myself to maintain by sound historical argument.

Note by Captain HAY, on a Bird, native of the Eastern Islands, undescribed (?) in a Letter to the Editor.

Kurnaul, June 7, 1841.

MY DEAR SIR,—If the following account of an extraordinary bird met with among the Eastern Islands may prove new and interesting, you will probably insert the following in your Journal: if otherwise, destroy the communication. It is as far as I can see a new genus, but distant as I am from books, or the means of access to new discoveries, and not being in communication with Mr. Swainson, what I insert is with diffidence.

I can hardly describe the colours of this bird better than by saying, it partakes of precisely the same met with in that well-known and beautiful moth, the Bombyx Atlas, upon which insect it is supposed to feed; and it is not improbable, for their localities are the same, and it will be seen how admirably adapted for a trap is its mouth.

On first obtaining this very extraordinary bird, I commenced examining the generic distinction of “Eurylaimus,” to which at first sight it appeared to be most likely allied. The *sombre* colours, together with its enormous bristles, seemed to point it out as a night-feeder, and sent me to hunt amongst the “Caprimulgidæ;” but with the assistance of Swainson’s Birds, 2 vols. in the Cabinet Cyclopædia, and of Vol. x. of the Naturalist’s Library, I have not been able to discover any named genus, to which this very extraordinary, and I imagine very rare, bird belongs.

I have apparently two species, if they be not male and female; the length of one however being $16\frac{1}{2}$ inches, whilst the other is not above nine; and the larger coming from Sumatra, whilst the smaller was procured from Malacca, lead me to believe them different species of the same genus.

General colour of plumage, different shades of chestnut and rufous brown, or ferruginous. Wing coverts dark chestnut, tipped with angular white spots, shaded at the edges with black: the larger wing coverts are tipped with black spots, the white edging being scarcely visible; the neck has a collar (resembling a pendent crest from the back of the head) of similarly marked feathers, though less distinct. Whole of the

belly, and beneath wing and tail, pale ferruginous; throat and breast somewhat darker, and speckled with white: wings and tail ferruginous and barred.

Total length of bird $16\frac{1}{2}$ inches. The bill measures $2\frac{3}{4}$ inches, is wider than the head, and shaped much the same as in *Eurylaimus*; colour of bill dark red, edged with yellow: the upper mandible overlaps the lower, and has a very sharp edge; bill strong, but not thick in proportion to that of *Eurylaimus*. Nares so small as to be scarcely visible, and so flat that the point of a penknife cannot easily be introduced; not basal and round as in *Eurylaimus*, but longitudinal, and covered by long bristled feathers lying along and over its extremely hooked bill; similar feathers cover the bill to its base, and then recline; width of bill at base $2\frac{1}{4}$ inches. The eyes are not furnished with lashes above. Wings long and rounded, the sixth quill the longest and tipped with black. Tail 6 inches. Tarsus feathered and long, ventral feathers entirely hide the feet, which are moderately strong, having the inner edge of the nails lengthened and somewhat flattened, middle toe the longest.

This is without exception one of the most extraordinary birds I have ever seen, and I do not remember it to be noticed by Dr. Horsfield. The nares being so different from the broad bills, and the supposition being, that it rests upon branches to receive and devour that immense moth, the "*Bombyx Atlas*," I would propose, should it be a new genus, naming it "*Bombycistoma*;" or should a more experienced naturalist discover a genus already named, the specific name I would call "*Bombycivoras*." If however it is as I believe entirely new, I would name it "*Bombycistomas Fullertonii*," after the late Governor of Prince of Wales' Island, whose kindness first led me to visit the Eastern Isles, and where I first imbibed my taste for Ornithology.

In describing this bird I have before me, specimens of the genera "*Eurylaimus*," "*Cymbirynchus*," and "*Psarisomus*."

Batrachostoma
Stictopetris, Lat.

The second species which I have above mentioned, has a less brilliant plumage, and length only 9 inches. Bill $1\frac{1}{2}$ inches in width, similar to the former, but the bristles covering the nares are less prominent; wings not so lengthened; belly of a much lighter colour; and the beautiful white and black spots so conspicuous on the larger bird here scarcely attract the eye.

A third bird procured by me at Malacca would appear to unite the bird first described with *Eurylaimus*; the bill in shape and form is the same, but wanting the stiff bristles; the legs are also much stronger, nails differently formed, and tarsus naked. As this is also a rare bird, I will describe it as well as I am able. Extreme length 11 inches. Bill $1\frac{1}{4}$ inches in width; culmen more arched than in the former, or than in either of the genera above named; eyes unprotected. Nares basal and round, colour bluish black, throat and upper part of breast dirty ochre. A white bar under both wings and tail. This possibly may have been described, but I think not. These Broadbills are a very interesting series of birds; the most dull in colour is that last described, and by far the most beautiful, the "*Psarisomus Dalhousiæ*" of Swainson, which rare bird I have been so fortunate as to procure.

My desire is to make, what I consider a new bird known; not to claim a name, which after all may be considered inappropriate, and would then be passed over by Naturalists, "as if it never had existed."

It appears to me, that this will be the typical character of the Broadbills instead of *Eurylaimus*, in which case its name will be changed by Swainson, under whose observation I hope this bird may come.

The enclosed very rough sketch will serve to give some idea of the appearance of the head or bill, and if it prove new, it may be interesting to your Ornithological readers.



Corydon
Swainson

Examination of some decayed Oriental Works in the Library of the Asiatic Society. By H. PIDDINGTON, Esq. Officiating Curator, Museum Asiatic Society.

At the request of our Secretary, I have undertaken the chemical examination of the decaying Oriental MSS. Works in the Society's Library, of which the following is a description :—

It is found that, principally in the Arabic books, at the end of a certain time, a shade of black is observable about the letters. This gradually appears to increase to a cloud round each word, such as would be produced by a light shading of Indian ink. It increases to a decided brown, and eventually a black colour, when the leaves become wholly decomposed in the middle, where the black is most intense, and fall to pieces like tinder, (the writing still remaining quite visible upon them,) so that they crumble under the fingers; and in short resemble, in those parts, books which have been burnt in close vessels; reminding us of the descriptions we read of the MSS. of Herculaneum and Pompeii. In some places, where the page is surrounded with an ornamental border of red and black lines, the black line appears so completely to have destroyed the paper, that the page may be almost taken out, as if it had been cut round with a penknife. The Moulvees said it was owing to the "*kuth*," (catechu,) but the effect seemed a very unlikely one to be produced by an astringent. The disease, however, evidently arises from the ink; the paper where not written upon, being in good preservation where it has not spread from the writing.

To discover what can have produced this very serious mischief, was the problem to be solved.

1. The smell of the carbonised parts was something approaching to that of caramel; the taste sharp, saline, and acid, but not caustic.

2. A quantity of the tinder-like matter from the centre of a book, equal to about half an octavo page, was boiled in distilled water. The solution was of a dark clear red-brown colour, it reddened litmus paper very sensibly; there was therefore free acid, and no free alkali present.

3. The presence or absence of the following substances were shewn by their corresponding tests as follows :—

Presence of	{	Sulphuric acid	...	...	Acet. Barytes.
		Muriatic acid, (trace,)	...	...	Nit. Silver.
		Potass,	...	...	Mur. Platina.
		Lime, (minute quantity,)	...	...	Oxal. Ammonia.

Absence of	{	Iron,	{ Tinct. Galls.
		.. ..	{ Prussiate Potass.
		Copper,	Ammonia.
	{	Nitric acid,	Mur. Acid and Gold leaf.

4. The solution being evaporated, a portion of the carbonaceous matter became insoluble. Cold alcohol did not act on the gummy mass left, nor was any soluble salt obtained by it.

5. Acetate of barytes was added to the clear solution, and the precipitate dried at a low red heat, weighed 2.25 grs. which would give 0.75 grs. of sulphuric acid for each half, leaf or 450 grs. (by weight) for a volume of 300 pages. This is of course but an approximative calculation; but we may be fully satisfied by it, that the quantity of free sulphuric acid in the book, is quite sufficient to produce the mischief.

6. This decomposition of paper, so as to crumble to pieces between the fingers, (though without being much discoloured,) is familiar to every chemist, as happening daily to the edges of his filters with acid and alkaline solutions of but moderate strength. The discolouration may arise from the ink and iron carried by capillary attraction through the fibres of the paper with the acid, or finally, since the ink remains unaltered in most parts, from the carbonisation of the paper.

7. I suppose the excess of acid to have arisen from the use of an excess of crude sulphate of iron (*heerakosh*) in the ink, which, either ignorantly or by design,* is added in too large quantities, and thus an extra portion of sulphate of iron, in addition to the sulphuric acid set free in the composition of ordinary inks, remains in it. Sulphate of iron is a sulphate of the protoxide of iron, and the vegetable matter of the paper being particularly prone to combine with both the acid and the iron, of which last the common iron-mould spots are such familiar examples; it may easily be supposed, that in our humid climate, with its high temperature, new chemical combinations must soon take place amongst the varied principles of paper and ink-starch: gum, vegetable fibre, gallic and sulphuric acids, iron, lime, and potass; of which, as we see, the result is, that the carbonaceous matter of the paper alone remains. An analogous effect is observed by mineralogists upon labels or wrapping papers, when, by the decomposition of pyrites, sul-

* By design. There are secrets in all trades, and our Moulvee informs me, that the copyists of "*Arabisthan*" well know that their books will not last *too* long, and so spoil trade.

phate of iron is formed in specimens. The specimen upon the table is an instance where this has gone on, and at the contact of the decomposed pyrites, the label is exactly reduced to the state of our books. Another effect, perhaps of this kind, is the discolouration of the leaves of books printed upon ordinary paper, in the making of which, it is said, gypsum is used in considerable quantities to increase the weight. In this case, as gypsum has a tendency to decomposition when in contact with vegetable matter, the sulphuric acid may also be set free? The paper of these books becomes brownish, brittle, and finally crumbles to pieces, so that it is called "the dry rot."

The practical inference to be drawn from all this, for our use and that of other Societies and collectors, is, I think, this; that in copying MSS. we must prohibit the use of mineral inks—being never certain of their composition—and employ only China ink, which with a little trouble, is well adapted for fine Oriental writing. This being pure sepia or carbonaceous matter, will probably be as lasting as the best paper. I have moreover recommended, that all paper used for copying in the Library, should be well soaked in a solution of alum, which will take off the excess of starchy and gummy matter in the size, and perfectly secure it against damp; for paper so prepared is crisp in the dampest weather, and no insect will touch it. I should thus hope our MSS. will be placed in safety for a long period; but I should urge on the Society the prudence of securing copies of all the rare works, in which this discolouration has begun. There is another practical inference, which I also take leave to suggest, and it is the following: May there not be a great mass of Government records, subject to this cause of decay, through the use of ill-made ink?

Museum, 26th June, 1841.

H. PIDDINGTON.

NOTE.—This valuable memorandum was prepared by Mr. Piddington, on my shewing him a copy of the "*Murrah ool Jinan*," which had been completely destroyed by the process above remarked on. The MS. is from Egypt, and copies of it very rare. Alarmed at the destructive process to which other valuable MSS. in the Library of the Asiatic Society were subjected by similar decomposition, I at once set copyists to work to make duplicates of all which shewed signs of decay, profiting by the suggestions offered in this paper, for prevention of the injurious effects of bad ink and paper. I may add, that I have procured from Lucnow a copy of the lost MS. which is in course of transcription.

On Bos Gaurus. By W. ELLIOT, Esq. M. C. S. (from the Madras Journal of Literature and Science.)

The notice of the Bovine Genera by Mr. Hodgson of Nepal, published in No. 114, and the observations on *Bos Gaurus* by that able naturalist and by Dr. Spilsbury, which have already appeared in this Journal, may be well followed up by an extract from Mr. Walter Elliot's (Madras Civil Service) "Catalogue of the Mammalia in the southern Mahratta country," describing the animal above named, with reference to an article by Mr. Hodgson on the same subject in the 6th vol. of this Journal. One or two short notes have been appended by Mr. Hodgson to Mr. Elliot's paper, which appear with this reprint of it. By thus borrowing Mr. Elliot's excellent paper from the Madras Journal of Literature and Science, I shall have been enabled to unite with and submit to my readers all that intelligent naturalists in various parts of India have observed and recorded regarding one of the most remarkable of Indian quadrupeds "indicated distinctly," says Mr. Elliot, writing in 1840, "only within the last two years," and doubly remarkable from its apparent identity with the extinct species, fossil remains of which have been exhumed in Europe.

It may be worth while to quote a curious notice, one of the earliest, if not the earliest, by any English writer, of the *Bos Gaurus*, from the narrative of his captivity in Candy by Capt. KNOX, (A. D. 1673,) who resided 19 years in the country: I met casually with it, and do not know but that it may have been quoted before. The writer is however so correct, and sagacious an observer, that I venture to incur the risk of repetition in order to supply testimony to the existence of the *Bos Gaurus* in Ceylon at the time of his confinement there.

(Knox's Historical relation of Ceylon, Chapter VI.) "Here are also wild buffaloes; also a sort of beast they call *gauvera*, so much resembling a bull, that I think it one of that kind: his back stands up with a sharp ridge; all his four feet white up half his legs. I never saw but one, which was kept among the King's creatures."



58.—*Bos (Bibos) Cavifrons*, Hodgson—Journal Asiatic Society Bengal, vol. VI. (1837) pp. 223, 499, 745.

Bos Gaurus, Griffiths.—*Gour*, Geoff.

Kar kona, Canarese.

Jungli khoolga, Dekhani.

Gaviya, Mahratta.

It is somewhat remarkable that one of the largest animals of the Indian Fauna, frequenting all the extensive forest tracts from Cape Co-

morin to the Himalayas, should only have been indicated distinctly, within the last two years. I have seen specimens from Tinnevely, and likewise from the whole range of the Syhadree mountains up to Mahableswhar, and I know that the animal has been killed near Vellore, in the Sherwaroyah hills near Salem, at Aseergurh, in Kandes, Rajamundry, and I doubt not that it will likewise be found in all the deeper recesses of the eastern Ghauts, and on the banks of all the great rivers passing through them. An imperfect cranium, which seems to belong to a female of this species, in the United Service Museum, is labelled thus "Head of a Bison from Kuddah, Straits of Malacca, presented by Lieutenant-Colonel Frith, Madras Artillery."

The following memoranda were made in 1833 in the southern Mahratta country, at a time when I had frequent opportunities of seeing the animal. "It is called *Gaviya* by the Mahrattas, *Jungli khoolga* and *Urna* by the Mahommedans, (though it has not the slightest affinity with the buffalo, to which both of these names apply), and *Karkona* by the Canarese, which is of similar import, from *Kadu*, a forest, and *Kona*, a buffalo.

It differs also very remarkably from the common ox, and though it approaches considerably more to the descriptions of the bison, the name generally applied to it by English sportsmen, it exhibits marked structural differences, excluding it from the Bisontine group as defined by Cuvier. These consist in the plane of the fore-head being "flat and even slightly concave," and in the possession of only 13 pair of ribs. It is not improbable that it will be found to constitute a connecting link between the Bisontine* and Taurine groups. The most remarkable characters in the animal are an arched coronal, or convex bony ridge, surmounting the frontal bone, and projecting beyond it so as to make the line from the vertex to the orbit a concave sweep; the continuation of which from the orbit to the muzzle is slightly convex. The other distinctive mark is the prolongation of the spinous processes of the vertebræ of the back, from the withers to the loins where they cease abruptly. These processes are 12† in number, and their prolongation gives the animal a very extraordinary appearance.

* One prime character of skull is enormous massiveness, three times that of the Ox's skull.—B. H. H.

† 13, or same as the ribs.—B. H. H.

The largest individual I met with, was killed in an island of the Kala Nuddee in the district of Soonda, in 1827. A noted shikaree, the Potel or headman of Alloor (a Hubshee or negro descendant of some of the numerous African slaves imported in the 15th century by the Mahommedan kings of Beejapoor, and who still exist as a distinct race, in this district,) called us at day-light, and promised to shew us one of the animals described by him as a wild buffalo. Crossing the river in a canoe, we struck into the forest and soon came upon a track which he pronounced to be that of a large bull. On this he proceeded with the steadiness and sagacity of a blood-hound, though it was often imperceptible to our eyes. At times when a doubt caused us to stop, he made a cast round, and on recovering the track summoned us to proceed by a loud whistle, or by imitating the cry of the spotted deer, for not a word was spoken, and the most perfect silence was enjoined. As we advanced he pointed silently to the broken boughs or other marks of the passage of a large animal, and occasionally thrust his foot into the recent dung, judging by its warmth of the vicinity of the game. We followed his steps for three miles to the river, then along the banks towards Dandelly, where the animal appeared to have passed to the other side. Wading across, we ascended the bank of a small island covered with thick underwood, and some large trees, amongst which it had lain down, about fifteen yards from where we stood. The jungle was so thick that we found it difficult to distinguish more than a great black mass among the underwood. On firing the animal got on his legs, received two balls more, and rushed into the jungle where he became very furious, and we were obliged to shelter ourselves behind the trees, to avoid the repeated charges he made, though one ball through the shoulder which had broken the bone above the elbow, prevented his moving with facility. He then became exhausted and lay down, snorting loudly and rising to charge when any one approached. A ball in the forehead caused him to roll over the precipitous bank into the river. Still however he was not dead, and several balls were fired into his forehead behind his ear and the junction of the head and neck without life becoming extinct; one ball which had struck the vertebræ of the neck was taken out almost pulverized.

When drawn ashore and examined more minutely, the first sentiment produced in all present, was astonishment at his immense bulk and

size; but on measuring his height we found him much taller than his breadth at first led us to imagine.

The head is very square, and shorter than in the common ox, the forehead ample, the bony ridge rising about five inches in height from the plane of the frontal bone over which it inclines. When viewed behind it rises suddenly and abruptly from the nape of the neck, from whence to the vertex it measures seven inches, the horns make a wide sweep, in continuation of the arched bony ridge, and turn slightly backwards and upwards, forming an angle of about 35° with the frontal bone, the whole of the head in front, above the eyes, is covered with a coat of close short hair of a light greyish brown colour which below the eyes is darker, approaching almost to black. The *muzzle is large and full*,* of a greyish colour, the eyes are smaller than in the ox, with a fuller pupil of a pale blue colour, the ears are smaller in proportion than in the ox, the tongue is very rough and covered with prickles, the neck is short, thick, and heavy, the chest broad, the shoulder very deep and muscular, the forelegs short, the joints very short and strong, the arm exceedingly large and muscular. Behind the neck and immediately above the shoulder rises a *fleshy gibbosity* (?) or hump, the same height as the dorsal ridge, which is thinner and firmer, *rising gradually* as it goes *backwards*,† and terminates suddenly about the middle of the back. The hind quarters are lighter and lower than the fore, falling suddenly from the termination of the ridge, the tail very short, the tuft only reaching down to the hocks.

The dimensions of this individual were carefully noted as follows :—

	feet inches.	
Height at the shoulder.....	6	$1\frac{1}{2}$
Do. at the rump (taken from hoof to insertion of tail).	5	5
Length from the nose to the insertion of the tail.	9	$6\frac{1}{2}$
Do. do. to the end of the tail which was 2 ft. 10 in.	12	$4\frac{1}{2}$
Do. of dorsal ridge including the hump.	3	4
Height of do. do.	0	$4\frac{1}{2}$
Girth (taken behind the forelegs)	8	0
Breadth of the forehead	1	$3\frac{1}{2}$

* Less than in *Bos* or *Bubalus*.—B. H. H.

† Quere forwards? The height of the true dorsal ridge declines from the third process of the vertebræ, and the general appearance of the ridge therefore is a declination, not a rise, towards the croup from the withers.—B. H. H.

From the muzzle to the top of the arched bony ridge ...	2	$1\frac{3}{4}$
Distance between the points of the horns	2	1
Circumference of horn at base	1	$7\frac{1}{2}$
Between the roots of horns.....	0	$13\frac{1}{2}$
Length of the ear	0	$10\frac{1}{2}$
Circumference of the neck	4	4
Depth of the shoulder (from the elbow to the end of the spinal ridge) ..	1	$2\frac{1}{2}$
From the elbow to the knee (i. e. the fore-arm) ..	4	$5\frac{3}{4}$
From the elbow to the heel	2	7
Circumference of the arm	2	6

The skin on the neck and shoulders and on the thighs is very thick, being about two inches in this one, which has already shrunk from lying in the sun. It is used for making shields, which are much prized. On examining the skeleton picked clean by the vultures, we could only distinguish thirteen pair of ribs.

The cows differ from the male in having a slighter and more graceful head, slender neck, no hump, a less defined dew-lap, and the points of the horns do not turn towards each other at the points, but bend slightly backwards; the horns are smaller too, and the frontal bone narrower, but the coronal or ridge is distinctly marked. The bulls have the forehead broader in proportion to their age. In the young bull it is narrower than in the cow, and the bony ridge scarcely perceptible. The horns too in the young specimen turn more upwards.

The general colour is dark brown, the hair thick and short, but in old individuals the upper parts are often rather bare. That on the neck and breast and beneath is longer, the skin of the throat is somewhat loose, giving the appearance of a slight dew-lap. The legs are white, with a rufous tint on the back and side of the forelegs. The skin of the under parts when uncovered, is a deep ochry yellow. The cow has the legs of a purer white.

The breeding season is said to be early in the year, and the calves are born after the rains. The bulls are often found separate from the herd, which consists generally of from ten to fifteen cows and a bull. They generally feed during the night, browsing on the young grass and the tender shoots of the bamboos, of which they are very fond. In the

morning they retire to some thicket of long grass, or young bamboos, where they lie down to ruminate. When disturbed the first that perceives the intruder stamps loudly with its foot to alarm the rest, and the whole rush through the forest, breaking down every obstacle, and forcing their way with a terrific crash,

————— dat euntibus ingens

Silva locum, et magno cedunt virgulta fragore.

Æn. vii. 676.

When suddenly approached in the night, they start off with a loud hissing snort.

In 1831, I saw a young Bison calf in the possession of some Gowlees, the owners of large herds of buffaloes in the Hangul talook. It was caught when just dropt, in the month of May, and when I saw it, was seven months old, very tame and gentle, though timid, licking the hands of the Gowlees, and frisking about with the buffalo calves. It was the same colour as the old animal, very dark brown with white legs. The head small, the forehead wanting the breadth so remarkable in the adult, and the bony ridge of the crown was hardly perceptible. The horns were just beginning to sprout, the ears larger and rounder than those of the buffalo, the eyes a pale grey or cerulean colour. The hair on the throat was long, and the dew-lap slightly indicated. No hump was perceptible, but the dorsal ridge was distinctly marked.

The Gowlees say, they see great numbers of Bison when pasturing their herds in the neighbouring forest. They describe them as very timid and watchful, more so than any other wild animal, always reposing in a circle with their heads turned outside, ready to take alarm. They add, that they see most calves from June to October, but the greatest number about August. They do not know how long the cow goes with calf, but suppose the period of gestation to be the same as that of the buffalo, or ten months and ten days. The old male drives the others from the herd at the breeding season, and the single ones seen in the jungle are young males of this description, and it is probable the very old bulls are sometimes expelled also by younger and stronger males."

For the following particulars derived from the observation of the animal in the Shervaroyah hills, I am indebted to Mr. Fischer, of Salem: "The Bison ordinarily frequents the hills, seeking the highest and coolest parts, but during the hottest weather, and when the hills are parched

by the heat, or the grass consumed by fire, the single families, in which they commonly range the hills, congregate into large herds, and strike deep into the great woods and valleys; but after the first showers, and when verdure begins to re-appear, they again disperse, and range about freely. In wet and windy weather, they again resort to the valleys, to escape its inclemency, and also to avoid a species of fly or gnat, which harasses them greatly. In the months of July and August, they regularly descend to the plains, for the purpose of licking the earth impregnated with natron or soda, which seems as essential to their well-doing, as common salt is to the domestic animal when kept in hilly tracts.

The chief food of the Bison seems to be the following grasses and plants:—

Yadanjān cody

Vallaum pilloo *A species of Sacharum, used for thatch.*

Odeserengan pilloo

The cottay woottoo leaf *Ricinus Communis, Castor oil Plant.*

Mullum pilloo *Anthystiria polystachia, Roxb.*

Canavum pilloo *Sorghum muticum. Wild Cholum.*

Cheevum pilloo *Broom grass. (Aristida).*

Cattoo Corangan leaf *A species of Convolvulus. Ipomæa*
Staphylina?

but they will eat with avidity every species of grain commonly cultivated on the hills or plains, as the ryots find to their cost. The Bison particularly is so fond of the *avaray cottay* (*Dolichos Lablab*, Ainslie),* when in blossom, that they will invade, and destroy fields of it, in open daylight, in despite of any resistance the villagers can offer. In other respects it is a very inoffensive animal, very rarely attacking any one it encounters, except in the case of a single bull driven from the herd. Such a one has occasionally been known to take up his location in some deep bowery jungle, and deliberately quarter himself on the cultivation of the adjacent villages. The villagers though ready to assist Europeans in the slaughter of Bison, will not themselves destroy them (the inviolability of the cow extending to the Bison); and so bold does this freebooting animal become in consequence, that he has been known to drive the ryots from the fields, and deliberately devour the

* Country bean.

produce. But in general it is a timid animal, and it is often difficult to get within gun-shot of them.

The period of gestation is with the Bison the same as with the domesticated animal; they drop their young in the months of September and October. I once had one brought to me so young, the navel string was still unseparated. I should think it was then about the size of a common country cow's calf of four months old. It seems a slow growing animal. A calf I had for three years was evidently in every respect still a mere calf. They seem very difficult to rear. I have known it attempted at different ages, but never knew the animal to live beyond the third year. Mr. Cockburn has tried it in vain, in its native climate, the Sherwaroyah hills, and I have made the attempt at Salem repeatedly. At one time I had five in my farm-yard; one lived for three years: but this one, with all the others, died suddenly in the same week from some disease, marked by refusal of food, running from the nose, and an abominable stench from the mouth. A similar disease, it may be noted, prevailed, I was informed, at the same time, among the Bison of the Sherwaroyah, Shandamungalum and Neilgherry hills. The calves I had, never became in any degree domesticated: the domesticated cow could never be induced to suckle them."

I may add, that the persevering ferocity of the Bison of the Sub-Himalayan range, described by Mr. Hodgson, is quite foreign to the character of the animal in the southern forests. When wounded, it is true, it charges its assailant with determined courage, and many instances have come to my knowledge of its doing so with fatal effect, among which I may cite those of two officers within the last few years, both of whom were killed at the Mahabaleshwar hills; but in general it will always seek its safety by flight, if permitted.

	inches.
Height from the end of the maxillary bone to the vertex...	22
Breadth of front between the edges of the horns.....	13 to 14
Length of horn from base to point in a straight line	21
Do. do. along the curve ..	30
Diameter (longest section) inside	$6\frac{1}{2}$
Do. (broadest do.).....	$4\frac{3}{4}$
Circumference at the base.....	$18\frac{1}{3}$
Distance between the points.....	39

*Proceedings of a Special Meeting held at the Asiatic Society's Rooms.**(Friday, 14th May, 1841.)*

The Hon'ble W. W. Bird, Esq. in the Chair.

Read the following letters ; viz.

From Mr. A. Csoma de Korosi of the 1st May 1841, tendering to resign the office of Librarian to the Asiatic Society of Bengal, and requesting permission to occupy his present quarters in the Asiatic Society's premises till the period of his departure from Calcutta. Also offering for the acceptance of the Society "the half of his salary" received by him during the three years of his employment as the Society's Librarian.

From Mr. Secretary Bushby, No. 309, dated the 7th April 1841, communicating copy of a letter from the Hon'ble the Court of Directors, advising that they had sanctioned the payment of an advance of £150 to Mr. E. Blythe, selected by Professor Wilson as Curator of the Museum of the Society, for his outfit and passage, and requesting information as to the mode most agreeable to the Society to refund the advance made to Mr. Blythe by the Court.

On the foregoing, it was resolved—

That the Committee recommend that the resignation of Mr. Csoma de Korosi be accepted, with the expression of the acknowledgments of the Society ;—That the Society do not accept the refund of the half salary for three years ;—That the Society with reference to the continued connection with Mr. C. de Korosi accede to placing him on the same footing as he was before he became Librarian, and permit him to remain in the rooms he now occupies till his departure.

That the Committee recommend the Society to employ a Librarian on 100 Rupees per mensem, and suggest that candidates be invited to submit their application,—the Secretary in the mean time, taking on himself the charge of the Library.

That the invitation be conceived in the following terms:—"The Society beg to state that no candidate need apply who is not a man of education and of literary habits, more or less acquainted with Oriental languages, and who is not prepared to attend in the Library for not less than four hours a day."

The question of re-payment of the advance to Mr. Blythe for outfit made by the Court of Directors being laid before the Committee, it was resolved—That the subject be left in abeyance till his arrival.

With reference to the foregoing Resolutions, the following letters to Mr. Csoma de Korosi and to Mr. Secretary Bushby were addressed, and a "Notice" published in the daily papers under this date.

' To Mr. A. CSOMA DE KOROSI,'

Librarian.

' SIR,—Having submitted to the Committee of Papers of the Asiatic Society your letter dated the 1st instant, tendering your resignation as its Librarian, with

liberty to retain your present quarters till the period of your departure from Calcutta, as also the offer of half the salary received by you during the three years of your employment, I am desirous to state that, although the Society accepts your resignation, with the expression of its acknowledgments for your valuable services, yet it cannot accept your offer of the refund of "the half salary for three years;" but your motives for making it are duly appreciated.

2. With reference to the continued connection with yourself and the Society, the Committee of Papers accedes to placing you on the same footing as you were before you became Librarian, *i. e.* to receive an allowance from the Society of Rupees 50 per month, with permission to retain, till your departure from Calcutta, the rooms now occupied by you.

3. The foregoing arrangements to have effect from the 15th instant.

I am &c.

(Signed) H. TORRENS,
Secretary Asiatic Society.

' To G. A. BUSHBY, Esq.

' Secretary to the Government of India.

' Gen. Dept.

' SIR,—I have the honor to acknowledge the receipt of your letter, No. 309, dated the 7th ultimo with its enclosure, and in reply to state for the information of the Right Hon'ble the Governor General of India in Council, that the Asiatic Society would prefer that the consideration by them of the suggestion of the mode of refunding the advance of £150, for outfit and passage made to Mr. E. Blythe, who has been selected as the Curator of the Society by the Hon'ble the Court of Directors, be left in abeyance till the arrival of that individual.

I have, &c.

(Signed) H. TORRENS,
Secretary Asiatic Society.

NOTICE.

Wanted, a Librarian for the Asiatic Society of Bengal, at a Salary of Rs. 100 per month. No candidate need apply who is not a man of education and of literary habits, more or less acquainted with Oriental languages, and who is not prepared to attend in the Library for not less than four hours a day.

Applications to be submitted addressed to H. Torrens, Secretary Asiatic Society.

Proceedings of the Asiatic Society.

(Wednesday Evening, 7th July, 1841.)

Dr. J. J. HÆBERLIN, Senior Member present, in the Chair.

Mr. S. G. T. HEATLY proposed at the Meeting of the 2d June last, was ballotted for and duly elected.

Ordered, that the usual communication of his election be made to Mr. HEATLY, and that he be furnished with a copy of the rules of the Society for his guidance.

Library and Museum.

Books received for the Library of the Asiatic Society, for the Meeting of the 7th July, 1841.

Mantell's Wonders of Geology, London, 1838, 8vo. 2 vols.

The Calcutta Christian Observer, for June and July 1841, New Series, vol. 2d, Nos. 18 and 19.

Lardner's Cabinet Cyclopædia—Swainson and Shuckard's History and Natural arrangement of Insects.

Transactions of the Linnean Society, vol. 16th, part 1st, vol. 17th, part 1, 2, 3, and vol. 18, parts 1, 2, 3, 7 vols.

Calcutta Monthly Journal, &c. for May 1841, 1 vol.

Yarrell's History of British Birds, part 23d.

Annals and Magazine of Natural History, No. 41, March 1841.

Oriental Christian Spectator, Second Series for March, April, and May 1841, Nos. 3, 4, 5, Bombay.

Maha-Nataka, a Dramatic History of King Rama, by Hanumat, translated by Kali Krishna Bahadur, Calcutta, 1840, 1 vol.

Genealogical and other accounts of Maha-Raja Kali Krishna Bahadur, Calcutta, 1841.

Proceedings of the American Philosophical Society, vol. 1st, Nos. 12 and 13 for 1840.

Proceedings of the Linnean Society of London.

Catalogue des Livres composant la Bibliotheque de feu M. Klaproth, Paris, 1839. 1 vol.

Read the following report from Dr. E. ROER, appointed Librarian to the Asiatic Society of Bengal in the room of Mr. CSOMO DE KOROSI, resigned.

H. TORRENS, Esq.

Secretary, Asiatic Society.

Sir,—I have the honor to submit to you the following report:—

Having taken charge of the Library on Monday the 21st of June, I thought it my duty to ascertain the number of the European Books; the number not being specified in the Manuscript Catalogue, and I found it to be the following:—

English Books,	...	...	...	...	...	2,292
Ditto Pamphlets,	...	...	...	...	...	211—2,503
French Books,	...	...	...	...	...	1,140
Ditto Pamphlets,	...	...	...	...	...	209—1,349
Latin Books,	...	...	...	...	...	537
Ditto Pamphlets,	...	...	...	...	...	27— 564
Miscellaneous Books,	...	...	...	...	...	331
Ditto Pamphlets,	...	...	...	...	...	39— 370
Books lent out,	...	...	...	...	...	205
Ditto Pamphlets ditto,	...	...	...	...	...	14— 219—5005

It is highly satisfactory to me, as it will no doubt be to the Committee, to know that most of the Books belonging to the Society are in good condition. I am, however, sorry to say, that some of the Manuscripts of the Sanscrit and Persian Library are in a state which threatens irreparable loss, if not immediately transcribed.

Of these I forward a list.

The key of the Medal Cabinet having been delivered to me by MR. PIDDINGTON, I counted the medals in the presence of MR. DE KOROS and MR. BOUCHEZ, and found their number exactly corresponding to that stated in the list, excepting two impressions which were not mentioned in it.

My attention has been directed to the arrangement of the Books and of the Catalogue, and I avail myself of the present opportunity to make a few remarks.

The arrangement of the books is made, I perceive, according to the languages in which they are written, and in each division they are placed according to their size; the same plan is adopted in the Catalogue, with the exception, that the Books instead of being placed according to their size, are arranged after the alphabetical order.

I need not stay to inquire how this arrangement is at variance with a proper classification, as I think this is clearly apparent, I shall merely offer a few remarks concerning it.

As the proper and principal design of the arrangement of a Library is to promote the most extensive and the most beneficial use of the books, no classification which does not approach as near as possible to the natural division of literature in general, can be satisfactory.

An arrangement opposite to the classification of sciences, isolates the use of the books, while a Library, arranged as strictly as possible according to the subjects, suggests at once all that is, and all that is not contained in the collection relating to the different branches of science, and at the same time invites and introduces the inquiring mind into the outer halls of science.

All the large libraries which I have seen are arranged according to this plan, for instance those of Berlin, Goettingen, and Wolfenbuttel.

It is desirable, that this principle should be followed in the arrangement of every library; yet it must be allowed, that it can strictly be adhered to only in large collections which contain the leading works of every branch of learning; it must, however, be borne in mind, that an arrangement according to a well-concerted plan, though not followed out in the minor niceties, is infinitely preferable to an arrangement, based upon a contrary principle.

For a Catalogue there is not, however, the same necessity for such an arrangement. A Catalogue has to state only what books are in a library, and to point them out, so as to be easily and immediately found; the alphabetical order seems to be a sufficient provision.

This arrangement is adopted in the Catalogues of many libraries. There is, however, another purpose in the framing of a Catalogue which should not be forgotten, and that is to inform the man of reading and science, what advantages he may derive from consulting the library. It can scarcely be expected, that such information can be obtained by an alphabetical order. To peruse a Catalogue of a large library to ascertain what works it contains, relating to particular branches of learning, is a waste of time to which few people will submit, and consequently a library may contain many excellent works which have escaped the notice even of literary men, and the Catalogue therefore fails in accomplishing the most important purposes for which it was made.

If the foregoing remarks be correct, a new arrangement of the Library and Catalogue is desirable.

The number of books being 5,000 and upwards, is, I think, sufficiently large to sanction such an arrangement, and as a new Catalogue is now about to be printed, this is perhaps the most favorable time to make it, should the Committee deem it necessary.

Under this impression, I have directed my attention to a proper arrangement of the Library and Catalogue, which might afford the members of the Society the greatest facility in using the books.

I have now the honor to lay the arrangement which I think it desirable to make before the Committee; but I would, however, beg to say the arrangement is based on a Classification of the

subjects, only as far as the deficiencies of the Library will admit, and will afford, if not all, most of the advantages of the above plan.

A.	B.	C.
Classical Literature.	Oriental Literature.	European (modern) Literature.
	A Classic Literature.	
I. Philosophy.	II. History, &c.	III. General Literature.
	Thus also the Oriental Literature.	
	C.	
	European (modern) Literature.	
I.—Theology,		
II.—Jurisprudence,		
III.—Medicine,		
IV.—Philosophy,		
V.—Mathematics,		
VI.—Natural Sciences,		
VII.—History (including Diplomacy, Numismatology, Biography, Memoirs, &c.)		
VIII.—Geography, Topography, Statistics, &c.		
IX.—Travels and Voyages,		
X.—General Literature,		
XI.—Linguistics, (Dictionaries, Grammars, &c.)		
XII.—Proceedings, Records, &c. of Societies, Journals, &c.		
XIII.—Encyclopædia Works.		
XIV.—Maps.		

I have not stated the sub-divisions in the arrangement of the Library, as they must depend upon the number of works in each division.

In the Catalogue each division will be arranged alphabetically, according to the titles; but no sub-divisions will be made; still however, it will be desirable to annex an alphabetical Index of the names of the authors, with reference to the page of the Catalogue in which their works are to be found.

In concluding this Report, I would remark, that I have already completed in Manuscript, the Classical and Oriental sections, and the division of History also in the third section.

Should the Committee approve of the arrangement I recommend, I shall endeavour to complete it as soon as possible.

I have the honor to be, Sir,

Your obedient servant,

E. ROER.

July 1841.

Ordered that the Report be referred to the Committee of Papers for consideration, as regards the adoption of the plan of arrangement and classification of the Books recommended by Dr. ROER.

Read the following Report of the Officiating Curator for the month of June last:—

H. TORRENS, Esq.

Secretary Asiatic Society.

Sir,—For the month of June I have the honor to report as follows:—

“*Geological, Paleontological and Mineralogical Departments.*—Our catalogues and arrangements are continuing. In the Geological department we have obtained a very interesting addition to our collections. In my report to Government on the soils brought from China by Captain HALSTED, and sent to the Museum of Economic Geology, I pointed out that it was matter of much regret that no rocks accompanied the soils, from a place where so many curious phenomena had evidently taken place, and were yet going on. The Right Honorable the Governor General has been pleased to interest himself in this matter, and to request Captain HALSTED to favour us with any specimen of the rocks which he might possess, and the result is the very curious series now on

the table; being basaltic hornblende from the central peak, calcareous sandstones and concretions from the raised coasts and adjacent islands, with one or two specimens of indurated clays, and a specimen of what I should almost venture to term a lias limestone! found in boulders about the mouths of the volcanoes. When to this we add the fact that of sixteen specimens of the soils of the island, only two are in any degree calcareous, and these probably from the admixture of shells, we have evidence that the volcanoes have formed the soils by eruptions of mud, either before or since the upheavement of the island, since from the absence of the calcareous matter the soils cannot have been formed like the coast rocks. It would moreover appear, that the eruptions have been from different strata, amongst which one much resembles the lias, so great a novelty in Indian Geology; but which according to FRANKLIN, is found [in the basaltic district of Bundelcund, in the direct line between the mud volcanoes of Cheduba and those of Sommeancee.

Osteological.—We are beginning to mount the skeleton of the Neelghye.

Ornithological and Mammalogical.—Nothing new to report.

Conchological.—Captain HALSTED has obliged us by a small collection of shells from Cheduba and the neighbouring islands, of which some will be additions to our cabinet.

Botanical.—We have also in this department to announce an addition to the development of our knowledge of Indian Natural History. My report for the month of May, and the Paper on the Society's Himalaya Lichens, published in the Journal, anticipated the probability, that we should discover valuable ones in our vast extent of territory; and I have now the pleasure to announce, that one of our own specimens No. 17, which at first gave a brilliant crimson, has now changed to a rich purple, shewing that it is of considerable value as a dying Lichen. The bottle containing the liquid has been placed at the disposal of the Right Honorable the Governor General for transmission to England; and we shall endeavour to procure such a supply of the Lichen, as may enable proper experiments to be made.

Museum of Economic Geology.—DR. ANGUS has been kind enough to procure for us from DR. HUNTER of Futtyghur, specimens of the green glass bottles, and of the mixture used for manufacturing them there, as also of the clay from which the fire bricks are made.

He has also been good enough to promise us larger specimens of the materials from which the frit of the glass bottles is made, the scum and the melted material, we shall then possess in a second instance, (MR. W. PRINSEP's contribution from the iron mines of Burdwan being the first) specimens of a complete Indian mineral manufacture, from the raw material up to the finished production for the use of man.

Additions to the Museum have been as above stated.

Captain Halsted, H. M. S. Childers.—Geological specimens from Cheduba.

A collection of Shells, principally from Cheduba.

Dr. Hunter from Futtyghur through Dr. Angus.—Three green glass bottles from the Futtyghur manufacture, with sample of the mixture from which they are made.

Specimen of the earth from which the Futtyghur fire bricks are made.

H. PIDDINGTON,

7th July, 1841.

Acting Curator, Museum Asiatic Society.

Read letter No. 685, dated 18th June last, from the Secretary to the Government North West Provinces, forwarding Lieut. R. B. SMITH's communication, submitting outline of a project for the elucidation of the Economic Geology of the North West Provinces.

Read also a letter from Lieut. R. B. SMITH, of the 12th June last, received simultaneously with the foregoing, intimating the submission of his project.

Ordered, that the papers be referred to the Committee of Papers for consideration: meanwhile Lieut. SMITH be addressed to send the Tabular Forms prepared by him, said to embrace all points essential to the formation of an estimate of the Economic value of the materials specified and referred to in his letter to Mr. Secretary THOMASON, of 3d June 1841, paragraph 4.

Read a report from the Officiating Curator, of the 1st April 1841, on the Cabinet of Coins belonging to the Asiatic Society.

Read also a letter from Mr. CSOMA DE KOROSI, of 31st March 1841, with a list on the same subject.

Ordered that the papers be referred to a Committee specially selected, for investigation and report upon the subject, with a view to the adoption of measures for preventing the cause of complaint connected with this particular branch of the Society's Museum; and in pursuance of the foregoing resolution, the Officiating Curator, MESSRS. HUFFNAGLE and STIRLING, and Dr. HÆBERLIN were selected to form a Committee for the purpose.

Read a letter from Capt. Geo. TWEMLOW, Bengal Artillery, of 18th June 1841, forwarding specimens of black shining ore-like particles, which form on the ground of the table land near the fortress of Gawilghur near Ellichpore after rain, wherever water has run, the ground being of reddish soil, formed apparently from Basalt under decomposition. On inspection of the specimens, they were pronounced by the Officiating Curator to be the common granular Magnetic Iron Ore.

Ordered, that Capt. TWEMLOW be informed accordingly.

Read a letter from Capt. W. E. HAY, of the 7th June 1841, descriptive of an extraordinary Bird he met with among the Eastern Islands.

Read a letter from Lieut. A. CUNNINGHAM, of the 25th June last, on the Inscriptions from the Girnar Rock.

Read a letter from Capt. JACOB, of 15th June 1841, forwarding a Transcript in Nagree characters of the Ancient Inscriptions on the Girnar Rock near Joonaghur, in Kattywar, comprising the Eastern portion of the Rock.

Read also two letters from Lieut. POSTANS, on the products of Khorassan.

The Secretary informed the Meeting, that the subjects treated of in the foregoing papers, would be published in early numbers of the Asiatic Journal.

Read a letter from Mons. E. BURNOUF, of 12th April 1841, acknowledging Moorcroft's Travels, and regretting the interruptions of intercourse between the two Societies, &c.

Read also a letter from the Secretary Linnean Society, London, 10th November 1840, forwarding 3 vols. of the Transactions of the Linnean Society, and noticing the irregularity with which the Asiatic Researches have been received by the Linnean Society, with Memo. of what portions of the publication have been received.

Ordered, that the publications required as presentations be forwarded, and occasion taken to improve the connections of the Society with scientific bodies in England, and on the Continent of Europe.

As connected with the subject, the question for printing the Transactions of the Society was discussed, the printing of which had been neglected for several years from the want of subjects, the magnitude of the expence of printing, &c. In removal of the first objection, the Secretary proposed to place at the disposal of the Committee of Papers such papers as were received by him from

contributors to the Journal for consideration, whether they should be omitted in the Journal to be printed in the Transactions.

Referred to the Committee of Papers for consideration and report.

Read letter from Moulvie ABDULLAH, of 11th June 1841, soliciting the patronage of the Asiatic Society by subscription of his undertaking in reprinting the three volumes of the *Futwa Alumgeri*, a work of great merit and of extensive use in Mahomedan Law.

Also referred to the Committee of Papers for consideration and report.

Read a note drawn up by the officiating Curator, on the examination of some decayed Oriental works in the Library of the Asiatic Society.

A carved Slab, dug up at Gurgoon, was presented by the Assam Tea Company. In forwarding it, the Secretary, Mr. Hampton, writes: "By desire of the Directors of the Assam Company, I have the pleasure to forward for the acceptance of the Asiatic Society, the accompanying carved Stone, "received recently from Assam."

Read letter from Rajah KALLEEKRISHNA Bahadoor, of 23rd June 1841, forwarding for the acceptance of the Society, a copy of his English version of Maha-Nataka, a dramatic Hindu work, originally written in Sanscrit, together with the original, and a short account of himself.

Read letter from Mr. Secretary MADDOCK, of the 28th June last, regarding the furnishing of certain instruments required for the Magnetic and Meteorological Observatory, proposed to be established at Lucknow.

Referred to the Officiating Curator for report.

An iron Bar of exact linear measurement for surveying purposes, constructed by the late Mr. James PRINSEP, presented by his brother and executor W. PRINSEP, Esq. was submitted for the inspection of the Meeting.

For all these presentations and contributions, the thanks of the Society were accorded.

JOURNAL

OF THE

ASIATIC SOCIETY.

Scheme of a Table for all Time. By Capt. R. SHORTREDE, Assistant Surveyor General.

I enclose for publication, if you approve, in your Journal, a Perpetual Time Table, which I constructed sometime ago; by the help of which may be found in less than half a minute, the week-day of any date for thousands of years, past or future.

Besides the directions given on the back, little more seems necessary to render intelligible the method of using it. The Table consists of three concentric circular cards, each having seven divisions corresponding to the days of the week. On the outer are written, from left to right, on three circles, the odd years of a century. On the second card are written the full centuries, of New Style on the outer, and of Old Style on the middle circle; the order of these being from right to left. Within are the days of the week from left to right. The third card has the days of the month from left to right, and within these, the twelve months in a peculiar order, each following month being as many divisions to the left as the days in the preceding month exceed 28.

In using the Table, the first thing is to adjust the second card with its proper century to the zero on the outer card; thus for 1841 New Style, the full century being 18, the division containing the N. S. 18 on the second card, is to be brought opposite that division on the outer card which contains the double zero (00). This being done, the middle card will require no change till the year 1900, when the centurial division containing 19 (N. S.) is to be brought opposite the (00) division.

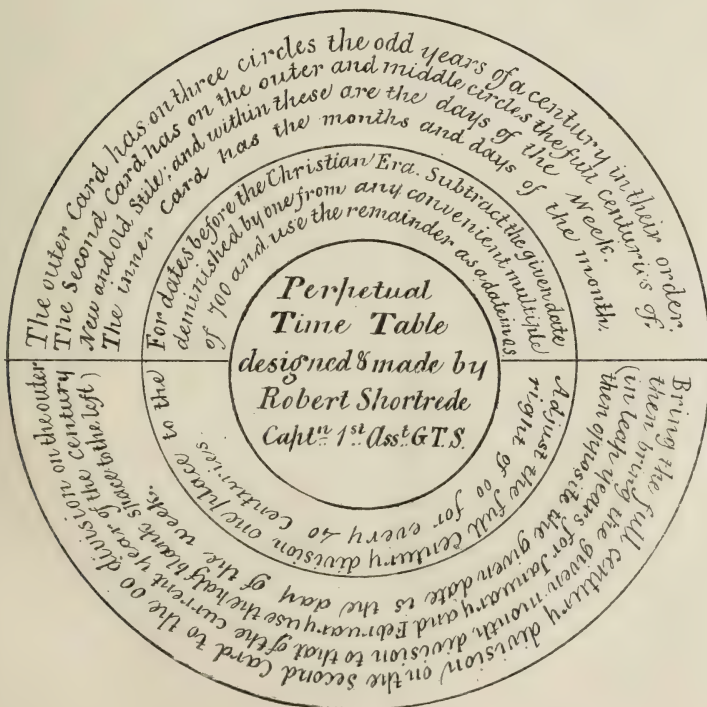
The odd year 41 of the century being found on the outer card, the division containing it is that by which the months are to be adjusted throughout the year: the division containing the given month being brought opposite that of the 41, the days of the month will be opposite their proper week-days. For example, to find the week-days of the 8th and 18th of June—*June* being brought opposite the 41, opposite the 8th will stand Tuesday, and opposite the 18th stands Friday. In like manner *December* being brought opposite the 41, opposite the 23rd stands Thursday. For the 18th June 1815, the centurial adjustment remaining unchanged, June being brought opposite the year 15 on the outer card, the 18th is seen opposite Sunday. The battle of Preston happened on the 21st September 1745, Old Style, required the week-day. The Old Style century 17th being brought to the 00, and September to the year 45, opposite the 21st stands Saturday.

The battle of Culloden was fought on the 16th April 1746, O. S. required the week-day. The centurial adjustment remaining as before, April being brought opposite the year 46, opposite the 16th stands Wednesday.

Thus the Table is used with equal facility for N. S. or O. S. dates.

The second card having the full centuries of both styles, (which may be continued at pleasure), shews at once those which have the same week-days. The O. S. centuries are continued by successive additions of 7, and those of N. S. by additions of 4. The reason of which is, that a Julian or O. S. century having 25 leap years, consists of 5200 weeks and 125 days. Now 125 days are short of 18 weeks by one day, hence each Julian century commences on a week-day earlier by one than did the preceding century; so that the same week-days must recur after a period of seven centuries. But in the New Style there are three Gregorian centuries and one Julian; and as a Gregorian century has only 24 leap years, it consists of 5200 weeks and 124 days, being two days short of 18 weeks. The loss of two days on each of the three Gregorian, and one day on the Julian century, amounts to a week every 400 years, and hence the recurrence of the same week-days in the order above mentioned.

When Pope Gregory XIII. in 1582 introduced the New Style, the object was to adjust the festivals in the Calendar to the same time of the year as they held at the time of the Council of Nice in 325; ten





days were added to the reckoning by counting the 14th instead of the 4th of October, as it was estimated that so much had been lost during the interval. It would, however, have been correct had only 9 days been added, because from 325 to 1582 there are 1257 years, during which 3 days having been lost every 4 centuries, it is clear that 9 days must have been lost in 1200 years, and the reckoning of the odd 57 years being the same according to both styles.

By adding ten days to the Calendar, the festivals have in fact been adjusted to what they were in the century before the Council of Nice.

This mistake may be shewn by the Table, where it is seen that the same week-day is common to the full century 30 according to both styles, and as the coincidences occur at intervals of 28 centuries, the same week-day is common to both styles in the full century 2, whereas the week-days of the full century 3 differ in Old and New Style. The agreement would be perfect in the year 225, but wrong by a day in the year 325.

This mistake in adjusting the New and Old Styles, is similar to that committed in settling the Epoch of the Christian Era, the true time, as is now generally admitted, being 4 years before the common reckoning.*

As it is often convenient to reckon dates before the Christian Era in Julian years, I have given a rule for finding the week-days of such dates with facility, by observing that they recur in the same order every 700 years. The rule is this: subtract the given year diminished by one from any convenient multiple of 700, and use the remainder as if it were a common Old Style date.

As the Gregorian adjustment of the Calendar causes an error in excess of about one day in every 40 centuries, this may be allowed for by adjusting the full century-division not to the 00, but one division to the right of it for every 40 centuries. This adjustment renders the Calendar perpetual, so far as depends upon our present knowledge of the length of the year; but the adoption of this, or the correction of any error which may be found to be involved in it, will remain for future generations.

22nd March, 1841.

P.S.—The proper method of manipulating the Perpetual Time Tables, is the following:—In adjusting the full century to the zero, put the two

* See Barlow's *Mathematical Dictionary*, art. Epoch; or the *Essay in Fergusson's Astronomy*.

first fingers of each hand to the back of the card, (the zero being toward the front,) then with the thumbs move about the second card to the required position.

In making the monthly adjustment, hold the outer card between the fore-finger and thumb, the division containing the odd year of the century being to the front, then putting the thumb of the other hand over the centre on the face and the forefinger at the back, turn about the central card till the proper month division comes opposite that of the odd year.

Notes on Capt. SHORTREDE'S Scheme. By W. MASTERS, ESQ.

1. Let the 1st of January begin with any day of the week A, and write down in succession all the months, with their days under corresponding days of the week thus:—

	A.	B.	C.	D.	E.	F.	G.
January	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
February				1	2	3	4
	5	&c.	&c.				

2. The following peculiarities will present themselves:—

First. The arrangement of dates and days of the week, correspond in these months: January and October; February, March, and November; April and July; September and December; the other three months May, June, and August, are isolated months, having no correspondence of arrangement with any other.

Second. In leap years, the dates from 1st March to 31st December inclusive, will arrive a day later in the week. As the additional day of leap year comes at the end of February, it does not affect the correspondence of dates and days for January and February.

Third. The vertical dates of January and October fall on the same days.

Fourth. The vertical columns of dates are found in the same order and succession in all the months, but under different days of the week : the agreements noticed in Obs. first excepted.

Fifth. The dates of the first column of January, and similarly the other columns, fall in *May*, one day of the week *later* ; in *April* and *July* one day *earlier* than they do in January.

Sixth. The dates of the 1st column of January (and similarly all the others) will in *August* fall *later* in the week by one day than they do in *May* ; and in *September* and *December* one day *earlier* than they do in *April* and *July*.

Seventh. The same dates in *June* fall *earlier* in the week by one day than they do in *September* and *December* ; and in *February*, *March* and *November* one day *earlier* than in *June*, or one day *later* than in *August*.

Eighth. If the 1st of January fall on any day of the week A, the following dates will fall on the same day :—

- | | | | | | |
|----|-----|-----|-----|------|----------------------------------|
| 1. | 8. | 15. | 22. | 29th | of January and October. |
| 5. | 12. | 19. | 26. | — | of February, March and November. |
| 2. | 9. | 16. | 23. | 30th | of April and July. |
| 7. | 14. | 21. | 28. | — | of May. |
| 4. | 11. | 18. | 25. | — | of June. |
| 6. | 13. | 20. | 27. | — | of August. |
| 3. | 10. | 17. | 24. | 31st | of September and December. |

3. The dates and months, exhibited in Observation 8th of Article 2, are grouped together in Capt. Shortrede's scheme on the inner or smallest card, and arranged in a peculiar order, as the author expresses himself, having reference to the eight Observations of Article 2.

4. Some years have 365 days and some 366 : three years in succession have 365 days each, and the fourth year (with exceptions to be noticed) has 366 days. The year that has 365 days has 52 weeks and one day over ; therefore, whatever day of the week begins such a year, also ends it. During three such years three days of the week in succession begin and end those years ; the 4th day begins the 4th year ; but as this year has 366 days, which are equal to 52 weeks and 2 days, the day after the 4th day, that is, the 5th day, will end the year. Calling these four years a series, we may say that whatever day of the week begins the series, the 5th day in succession ends it. The 6th day in succession begins and ends the 1st year of the next series ; the 7th day begins

and ends the 2d year of that series; the 8th day (i. e. the 1st week-day with which we commenced) begins and ends the 3d year; and the 9th (or 2d day) begins the 4th year; but does not end it, because it has 366 days; the 10th (or 3d day of the week) ends it: and so on.

5. Let the days of the week be called *a, b, c, d, e, f, g*, without, at present, particularising which day of the week is called *a*, or *b*, or *c*, &c. The following Table is constructed on the principle explained in 4. It consists of series of 4 years each which are marked 1st, 2nd, 3rd and 4th; the days of the week that commence these years are placed vertically underneath; the fourth year has always two letters; the first indicating the day of the week on which that year begins, the second letter, the day on which it ends. The arrangement commences with the 1st day of the 1st year of any century; with the year 1, or 101, or 1601, or 1801; and the 1st of January is supposed to fall on a day of the week called *a*.

Series.	1st year.	2nd year.	3rd year.	4th year.
1	a	b	c	d and e
2	f	g	a	b and c
3	d	e	f	g and a
4	b	c	d	e and f (Table 1.)
5	g	a	b	c and d
6	e	f	g	a and b
7	c	d	e	f and g
8	a	b	c	d and e

6. After 7 series of 4 years each=28 years, the same succession commences.

7. From Table (1) may be formed another (which will be given hereafter) exhibiting all the years of a century that begin with the same day; but it will be more convenient to shew first, how the centuries commence; and of centuries, the centuries of Old Style first; reminding readers that, according to Old Style, every 4th year, without exception, is a leap year, and consists of 366 days.

8. By attending to Table (1) it will be seen, that the series consist of lines of years and days of the week in succession; each series has 4 years and 5 days of the week. If we fancy weeks lengthened out into one uninterrupted line of days, the first day *a* of the second week will be called the 8th day; 4 weeks will be called 28 days; and Table

1, or rather the succession which it shews, may be represented by the following progression :—

Series, 1 2 3 4 5... 25 ...50, &c.

Years ending these series, . 4 8 12 16 20...100 ...

Days beginning these years, 4 9 14 19 24...

The common difference of the years is 4, of the days 5 : the 25th term will therefore be year 100 and day 124 : 124 days equal 17 weeks and 5 days ; therefore the 100dth year will begin with the day *e*.

9. According to Old Style this progression may be extended to series 50. The fiftieth term of the progression will be, year 200 and day 249 ; 249 days equal 35 weeks and 4 days ; therefore the 200dth year begins with the 4th day *d*. In the same manner it may be found that the year 300 begins with the third day *c* ; the 400dth with the 2d day *b* ; the 500dth on the first day *a* ; the 600dth on the 7th day *g* ; and the 700dth on the 6th day *f*.

10. Hence every 100dth year commences on a week-day, one day earlier than the preceding 100dth year : consequently if the year 1 of any century begins on any week-day *a*, the year 1 of the next century will begin on the week-day *g*,—*i. e.* a day earlier.

11. In Old Style all the days of the week in their turn commence a century and a 100dth year.

12. The following Tables are formed according to Articles 8—10. The Table marked (2) shews how each hundredth year begins. Table (3) shews how each century or first year of each 100 begins :—

Days of the week	e	d	c	b	a	g	f	(Table 2.)
begin Hundredth years, <i>i. e.</i> years 100, 200, 300, &c.	1	2	3	4	5	6	7	
	8	9	10	11	12	13	14	
	15	16	17	18	19	20	21	
	22	23	24	25	26	27	28	
	29	30	31	32	33	34	35	
	36	37	38	39	40	41	42	
Days of the week	a	g	f	e	d	c	b	(Table 3.)
begin centuries or years 1 of 100 ; 1 of 200, &c.	1	2	3	4	5	6	7	
	8	9	10	11	12	13	14	
	15	16	17	18	19	20	21	
	22	23	24	25	26	27	28	

13. Now follows the Table (marked 4), exhibiting all the current years of a century that begin with the same day of the week. The primary arrangement is for the current years of the 1st century beginning with year 1. Underneath this, the letters denoting the days of the week are so arranged as to shew how the superincumbent columns of years begin in the other centuries in succession; an arrangement which will be quite intelligible by attending to Art. 10.

a	b	c	d	e	f	g	
1	2	3	4	—	5	6	
7	8	—	9	10	11	12	
—	13	14	15	16	—	17	
18	19	20	—	21	22	23	
24	—	25	26	27	28	—	
<hr/>							
29	30	31	32	—	33	34	
35	36	—	37	38	39	40	
—	41	42	43	44	—	45	(Table 4)
46	47	48	—	49	50	51	
52	—	53	54	55	56	—	
<hr/>							
57	58	59	60	—	61	62	
63	64	—	65	66	67	68	
—	69	70	71	72	—	73	
74	75	76	—	77	78	79	
80	—	81	82	83	84	—	
<hr/>							
85	86	87	88	—	89	90	
91	92	—	93	94	95	96	
—	97	98	99	100	—	101	
<hr/>							
g	a	b	c	d	e	f	for odd years of 2d century.
f	g	a	b	c	d	e	_____ 3d _____
e	f	g	a	b	c	d	_____ 4th _____
d	e	f	g	a	b	c	_____ 5th _____
c	d	e	f	g	a	b	_____ 6th _____
b	c	d	e	f	g	a	_____ 7th _____

14. It will be seen that the above columns of years begin with fixed days for fixed centuries. If the century begins with any day, the first column of years will begin with that day, the other columns with the next day in succession. Table (3) shews how the centuries commence; and when this is known, Table (4) will readily shew how the years commence.

15. These columns of years are arranged in Capt. Shortrede's scheme in a circular order, and occupy the seven divisions of the outer card, in

the same succession in which they stand above, with a few exceptions.

16. The exceptions are the leap years, which are advanced one division to the right of their proper division, for the reason given in Observation 2 of Article 2: this occasions error in week-days corresponding to January and February, but the scheme says, "in leap years for January and February use the half blank space to the left, then opposite the given date is the day of the week." This is obscure; and, if I understand the author aright, incorrect. The meaning of the author appears to be, "use the division containing May as if January had been there, and fancy February to be where June is." This will lead to error. The direction should be—for January and February in leap years take that day which is one division to the left of the day opposite to the date. The week-day for January and February is one day earlier than the day opposite to the date.

17. Although the leap years are thus advanced, the author of the scheme appears to have left half the digits of the numbers expressing those years in their proper divisions; for there are four 4s, 2s, and 6s and five 8s in different divisions. This is objectionable, because these numbers may bewilder those who are reckoning for the current years 2, 4, 6, 8; and, if the scheme be printed for general use, should be omitted.

18. The middle card of the scheme contains not the centuries of (3) but the full centuries or hundreds of (2) for the convenience of reading. In Table (3) the days of the week for the current years of centuries are shewn in 7 lines: but in the scheme the full centuries and their fixed days revolve in a circle; and the days are readily made to assume their positions relative to the current years.

19. If the scheme had a century division, then by adjusting the century division, bearing the name of the week-day commencing the centuries which it contains, with the year division containing the years 1, 7, 18, 29, all those years would be shewn to commence with that day; and the years in the other divisions, with the days standing below them, for those centuries.

20. But the hundred years or full centuries are more convenient for reading, as years 101, 1801, 1841, &c.; then the 100dth year must be so adjusted to a year division that the day on which the following cen-

ture commences, shall fall exactly under the division containing years 1, 7, 18, 29, &c.

21. The scheme has been regulated according to the hundreds or full centuries; and therefore, when it is to be used, the full-century-division must be adjusted with a current-year-division in accordance with Art. 20.

22. By comparing Tables (2) and (3) it will be observed, that each hundredth year commences two days earlier than the succeeding century. The 2 hundredth year of (2) commences with *d*; the 3d century of (3) begins with *f*; the 3 hundredth of (2) begins with *c*; the 4th century begins with *e*; in each case the hundredth year begins 2 days earlier; therefore, in using the scheme the full-century-division is to be adjusted with the current-year-division 2 remove to the left from the division containing years 1, 7, 18, 29, &c; that is, with the division containing the years 5, 11, 22, 33, &c.

23. But, because the hundredths or full centuries of Old Style are all leap years, they are thrown one division to the right according to Art. 16, and are in consequence to be adjusted with the year-division containing the years 6, 17, 23, 34, &c. The hundreds or "full centuries," do not commence with the day of the week over which they stand, but with the day to the left; consequently, although the full-century-division is shifted, the week-day commencing the next century or the year 1, falls in the right place under the division containing year 1.

24. The division containing the years 6, 17, 23, 34, &c., have two cyphers 00 for reference. If the scheme be published for general use, it would be an improvement to substitute a black dot, such as is used in the Nautical Almanac to represent the New Moon.

25. Let us now turn our attention to the New Style. In the year 1752, it was "enacted by 24 Geo. II. c. 23, that instead of cancelling *ten* days as Gregory XIII. had done, *eleven* days should be left out of the month of September; accordingly, on the second day of that month, the Old Style ceased, and the next day, instead of being the third, was called the fourteenth, and by the same act, the beginning of the year was changed from the 25th of March to the 1st of January."—*Ency. Met. Mis. and Lex. vol. iii. art. Calendar, p. 155.*

26. It was likewise enacted, that the Gregorian correction should be applied to certain years specified. According to the Gregorian rule,

every year divisible by 4 receives a day, or has 366 days. But every year divisible by 100 and not divisible by 400 has 365 days. The year that is divisible by 100 is also divisible by 4, since 100 is a multiple of 4: this part of the rule is therefore an exception to the first part, since there are years divisible by 4, which instead of having 366 days, have only 365. These years may be considered as losing a day to which they are entitled by the first part of the rule. The following are the years that lose a day. (It is to be remembered that those years which are divisible by 400 have 366 days: this is a part of the Gregorian rule.)

1700, 1800, 1900 — 2100, 2200, 2300,
2500, 2600, 2700 — 2900, 3000, 3100, &c.

27. Consequently, the correspondence of dates and days in Table (1) will not answer continuously for the New Style: it will be interrupted in the New Style at the 100dth year, corresponding with the 4th year of series 4 and marked (a) in the Table. The 100dth year begins and ends with *e*, because it is not a leap year; the next century, that is, the year 1 of the next century consequently begins with *f*; and the succession given in (1) will be again interrupted at the next hundredth in the same place at (a), which place will now be occupied with *c* and *d*, because the first year begins with *f* and not with *a*. Although Table (1) is referred to in this place, it is not to be understood that the letters *a*, *b* and *c*, have the same signification in New Style that they have in Old Style: *a* in Old Style may be one day of the week, and in New Style another. But proceeding as above, the days beginning the hundreds of New Style may be found out, and the following Table formed, marked (5): in which the letters are slightly altered in character for the sake of distinction, but retain the same relation of time or succession.

Week Days.	<i>e.</i>	<i>c.</i>	<i>a.</i>	<i>f.</i>	(Table 5)
Hundreds of New Style.	100	200	300	400	
	17	18	19	20	
	21	22	23	24	
	25	26	27	28	
	29	30	31	32	
	33	34	35	36	

28. Observe here that only four days of the week begin the hundreds of New Style; and three days of the week never have that privilege, not for 40 centuries. The years in column *f*, are all leap years in New Style. This accounts for that arrangement of Capt. Shortrede's scheme, which occupies only 4 of the 7 divisions with N. S. centuries.

29. About the time of the 40th century, the Vernal Equinox will be 1 day nearly in advance of the 20th of March; in which case if the British Calendar and British Parliament be in existence, it may be found necessary to throw out a day from the Calendar. If the measure be adopted in the year 4000 A. D. then this year will not be a leap year, and as 4000 is a multiple of 400, and consequently falls in column *f*, the year 4000 will begin and end with *f* Art. 4; the week-days *a* and *c* will go out and *b* and *g* will occupy their place for the next 40 centuries, during which period the hundreds will begin thus:—

d	b	g	e	
100	200	300	400	&c.

Centuries and years and hundredth years will begin a day earlier. By adjusting the "full-century-division one place to the right of 0 0 for every 40 centuries," according to the directions given in the scheme, a correction will be effected for the *current* years; but as the centuries and week-days are in fixed position on the same card, the prescribed adjustment is not effective for the *hundredth years* or *full centuries* on the middle card.

30. It is now time to shew the relation between the week-days of Old and New Style. On the 3d of September 1752, New Style was introduced in England, when the 3rd of September was called the 14th (25). Consequently the 14th of September N. S. fell on a certain day in the first week, but the 14th September O. S. fell 11 days after in the second week: therefore the New Style *dates* may be said to occur 11 *week-days*, that is, 1 week and 4 days, that is 4 *week-days* earlier than O. S. *dates*.

31. If it should ever happen that a day is rejected from any year by New Style and not by Old Style, then that year in New Style will end 1 day sooner than in Old Style; and consequently the next year of New Style will be another day earlier than Old Style; that is 12 days of date or 5 *week-days*; and as often as this happens, New Style will be an additional day earlier than Old Style.

32. This happens in those years of N. S. which are divisible by 100, but not by 400; that is in the years contained in the columns *e, c, a*, of Table (5). The following *centuries* begin as many days earlier in New Style than they do in Old Style, as are indicated by the numbers below them.

It is necessary to keep in mind that, as the intercalary day is thrown out in these years, at the end of February, this suppression of a day does not affect the calculations for the dates and days preceding the 28th of February: it makes those years *end* sooner, but not *begin* sooner or later in the week.*

Centuries, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30.

Days, ... 11, 12, 13, 13, 14, 15, 16, 16, 17, 18, 19, 19, 20, 21, &c.

Consequently the years from 1801 to 1900 inclusive begin 12 days earlier than they do in Old Style.

The *hundreds* of New Style advance as below:—

Hundredth Years, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29.

Days, ... 10, 11, 12, 13, 13, 14, 15, 16, 16, 17, 18, 19, 19.

Week Days, ... 3, 4, 5, 6, 6, 0, 1, 2, 2, 3, 4, 5, 5.

33. If New Style be carried back in theory, the preceding arrangement will shew that New and Old Style agree in the following hundredth years or full centuries.

Years A. D. 300, 1200, 1300, 2200, 3100, 4000, 4100.†

34. The year 1841 N. S. began on Friday, therefore the year 1841 O. S. began 12 days or 5 week-days later; viz. on Wednesday. The year 1800 N. S. began on Wednesday; the year 1800 O. S. began 4 days later on Sunday. But 1800 O. S. stands in column *b* of Table (2), consequently *b* is Sunday, and 1800 N. S. stands in column *c*. of Table (5) therefore *c* is Wednesday. Therefore the letters indicating the days of the week have the significations attached below:—

O. S. Table (2) *e* Wednesday.

d Tuesday.

c Monday.

b Sunday.

a Saturday,

g Friday.

f Thursday.

N. S. Table (5) *e* Friday.

c Wednesday.

a Monday.

f Saturday.

* The note at the foot of p. 35 Cab. Cyc. Chronology of History, "The Style" is partly erroneous.

† The agreement of 1200 commences on the 28th N. S. 29th O. S. of February of the year 1100, and terminates on the 28th N. S., 29th O. S. of February of the year 1300.

35. In Captain Shortrede's scheme, the days will be found one division to the left of the hundreds of O. S. which they begin, according to Art. 23 and 16. The N. S. hundreds will be found over their proper days, except the leap years of column *f*, which stand over Sunday instead of Saturday, Art. 23, 16.

36. It is essential to observe, that the scheme supposes the years both of Old and New Style to begin on the 1st of January.

I tested it with about a hundred dates taken from the "Cabinet Cyc." "Chronology of History;" "Hume's History of England;" "Bacon's Letters," and some anticipated dates carried forward by myself, and found the scheme to agree with all, except two. These were two from Bacon, as follows:—

1617. February 6th, Friday, Bacon, vol. 3d (Letters) page 361.

1620. March 8th, Thursday, do. do. — 599.

It subsequently occurred to me, that before the year 1752, the Ecclesiastical year began on the 25th of March, and consequently these years 1617 and 1620 should be read 1617-18 and 1620-21; because 6th February and 8th March fall near the end of years 17 and 20 of the old reckoning, and in the early parts of the years 18 and 21 of the new reckoning. The scheme (O. S.) agrees with this reading.

37. The dates from 3d to 13th September inclusive 1752, never existed in the British Calendar, Art. 25th; September the 2d was the day immediately preceding the 14th. By reckoning backwards from 1814 I find that the 14th fell on Thursday, consequently the 2d fell on Wednesday. Old Style in the scheme points to Wednesday, but Sept. 2d, 1752, N. S. points to Saturday. This disagreement was expected. Old Style is continuous, New Style carried back, is at fault between the 2d and 14th September 1752. A paper in the Rambler, is dated Saturday, March 14, 1752; therefore the 2d of September following fell on Wednesday. A paper in the Adventurer is dated Tuesday, November 7, 1752; therefore the 14th of September preceding was Thursday. The following dates agree with Old Style of the scheme, but not with New Style.

Tatler,	Saturday, March	11,	1709-10
,,	Tuesday, February	28,	1709-10
,,	Thursday, March	2,	1709-10
Guardian,	Tuesday, March	24,	1712-13



Table to accompany Mr. Master's Notes



Guardian,	Wednesday,	25,	1713
„	Friday, July	13,	1713
Spectator,	Monday, October	20,	1712

Where the two years are given, the ecclesiastical and the historical, the scheme agrees with the second or historical.

The inference is that the scheme, as matter of *fact*, is unservicable for dates in New Style earlier than the 14th September 1752; and similarly for Old Style as far in the “dark backward and abysm of time” as the first fault occurs; the *year of confusion* for instance.

38. In the author's directions for dates before the Christian æra, it would, perhaps, be better to substitute the word *year* for *date* in the words “subtract the given *date*.”

39. After the foregoing observations, the reason of the prescribed manipulation of the scheme will be understood.

By adjusting the century division to the division 0 0, the days commencing the current years fall under the right divisions by Articles 22; 23; 13; 14.

The day on which a year begins is the day on which these dates of January fall;—1 (of course) and 8, 15, 22, 29 by Obs. 8 of Art. 2.

The day on which these dates fall is the day on which certain dates of other months fall; vide Observations 8. of Art 2; and which are arranged on the smallest card of the scheme.

Therefore by bringing a month to the division of a current year, the week-day above shews on what day the subjacent dates of that month fall (with slight variation for leap years.)

The other dates of that month lie under their proper week-days by Art. 1.

There are no directions given how the scheme is to be used for years of the first century; viz. the years 1, 25, 60, 99, and the like, which have no hundred before them. It is therefore necessary to insert a cypher or zero among the hundreds of 7, 14, 21 of Old Style, thus 0, 7, 14, 21, 28, 35.

40. In the course of this investigation, my attention fell upon the Tables that relate to the Dominical Letters. The numbers are the same both in the Tables and in the scheme. It may therefore be anticipated, that the scheme will soon supplant the Tables.

41. The scheme given here will do for years before Christ without the trouble of calculation. It is however more curious than useful.

In the smallest card, use the black characters for years A. D. and the red characters for years B. C.

The same in the middle card. The centuries of Old Style will do for centuries before Christ; reading thus, 0 hundred, 7 hundred, 14 hundred, &c. B. C.

In the year-divisions, leap years A. D. are marked with black; leap years B. C. are marked with red.

In the use of the scheme, for years A. D. adjust the centuries with the year-division having the black characters 00, and read as directed in Capt. S.'s scheme, with this exception; in leap years for dates from the 1st of March to the 31st December inclusive, take the week-day that is in the next division to the right of the week-day opposite to the given date.

For years B. C. adjust the centuries with the year-division, containing the two red characters 00; and read as directed for A. D. years using the red characters. In leap years for dates between the 1st of March and 31st of December inclusive, take the week-day that is in the next division to the left of the week-day opposite to the given date.

La Martiniere, 5th May, 1841.

W. MASTERS.

Remarks by Capt. SHORTEDE.

§ 16. The only HALF blank spaces in the whole Table occur in the outer card, and are those of the odd centurial years divisible by 4, *i. e.* leap years. These are denoted by writing only the final digit; the space for the other digit (easily supplied from those before or after) being blank. These spaces are therefore *half* blank.

The way in which Mr. Masters interprets the direction, certainly leads to error; but how such an interpretation can fairly be drawn from the wording, does not readily appear. I am directing how to use the Table for any current year of a century, and as an exception to the general rule occurs in January and February of leap years, I provide for it by the direction within the parenthesis, which of course I mean to be taken as referring to the subject then treated of; viz. the particu-

lar division of the outer card opposite which the given month is to be brought. The meaning is this—instead of the current year division on the outer card marked like the others with two digits, use the division on the left, which being for distinction marked with only the final digit is half blank—opposite this half blank space on the outer card in leap years adjust the January and February months—but never fancy the months to be in any other division than that in which they are written on the inner card.—R. S.

§ 17. No confusion can arise if it be considered that a single digit *never* represents the current year of a century. For example, the 4th year of the full century 18 is 1804, represented by 04, and not by 4 merely. The whole date being expressed by the current year preceded by its full century, if the odd year be written 4 this preceded by 18 becomes 184, being the year 84 of the full century 1. Moreover the outer card has the odd years of a century *in their order*, *i. e.* increasing uniformly from left to right, and not at random.—R. S.

§ 21. The only adjustment required is to bring the division of the middle card containing the full century opposite the division containing 00 on the outer card, and when this is done, no farther adjustment of the middle and outer cards to each other can have place throughout *that* century.—R. S.

§ 23. These being leap years require according to the direction for January and February (and therefore on January 1st) to have the month division brought opposite the single 0 to the left of the 00, being in that case *the half blank to the left*.—R. S.

§ 24. The black dot would require a special explanation, for which there is not room on the back of the card, without confusion or omission of something more important. A total blank would be preferable to a black dot, but to this there would be much the same objection.

Either of these would derange the principle on which the outer and middle cards are adapted to each other. This principle is, that when the full century for the time being is opposite the 00 or point of adjustment, every odd year on the outer card is to be read as if it had its proper full century digits before it. The 00 is to be read in the same way as any other year of the century.

The Table might have been made adjustable by any other zero as well as by 00; and by any other date as by the 1st of January, but

these on the whole are considered to be the most convenient. Had the Table been adjusted by 1st March, we should have got rid of all trouble about the 29th of February in leap year, but should have incurred the inconvenience with our present Calendar of reckoning two months of each year as part of the year preceding.—R. S.

§ 29. Quite true. The adjustment referred to is that by which the full centuries are brought opposite the proper division on the outer card. After 4000 and till 8000, the full century-division is to be adjusted by the division on the outer card containing 01 instead of that containing 00 as formerly. The current year is then to be read on the outer card as usual. The full century being opposite the 01 division, that of the 00 will be one place to the left. Hence the full century will commence on a week-day earlier by one than that over the full century on the middle card. This arrangement was preferred to that of shifting the places of the full centuries on the middle card, as hereby the series of full centuries may be continued indefinitely backwards or forwards by uniform common differences.—R. S.

§ 37. This inference is unwarranted. New Style commenced in 1582, and from that time was used generally in Catholic countries. It was adopted by the Protestants of Germany in 1700, and in England 1752. For dates previous to these epochs in the respective countries, this Table or any other as a matter of *fact* must be unserviceable for New Style dates; because such dates did not exist. It is serviceable throughout the whole range of Old Style dates, which still are used in Russia and by the Greek Christians. *The year of confusion* having occurred before the Christian Era, is *out of date*. All such cases are provided for generally by the directions for dates before the Christian Era, and for all such, Old Style reckoning, even when fictitious, is perhaps the most convenient. In such cases, however, there is but little occasion to know week-days as a matter of historical reference.—R. S.

§ 39. No particular directions are needed. The full century in that case is 0, and at first this digit was inserted in the place now occupied by the letters O. S. The difficulty is sufficiently provided for by the remark, that the series of full-centuries *may be continued indefinitely*.—R. S.

*Notes on the Gems found at Beghram. By J. S. CHAPMAN, Esq.
Assistant Surgeon, 16th Lancers.*

MY DEAR SIR,—Having observed in the last number of the Journal of the Asiatic Society, the great interest you have taken in the Gems found in various parts of Afghanistan, and as you there make an earnest entreaty to be furnished with casts or impressions of all Gems, and particularly of those with inscriptions, I have the pleasure to send you a series of these singular relics discovered at Beghram, the locality of which spot has been so fully and ably described by Mr. Masson. For this purpose, my friend Colonel Cureton most kindly gave me free access to his cabinet, and all the Gems which I have selected for your notice are his, with the exception of the four last. Some of the specimens from Colonel Cureton's collection are of a superior order, equalling many of the antiquities of this nature found in Greece and Italy. One gem cannot fail in attracting much notice; viz. that of Abraham offering up his son Isaac; and there are others which will afford scope for speculation. Any other relics of this nature I may chance to meet with, I will send casts of the same to you.

I am, dear Sir,

Yours faithfully,

Meerut, August 22, 1840.

J. S. CHAPMAN.

No. 1. Garnets. A figure apparently intended for Apollo, as neatly and spiritedly executed as many of the ancient Gems of Greece and Italy.

No. 2. Cornelian. An historical gem of singular interest and value; the subject, Abraham offering up his son Isaac, is too clear to be mistaken, Genesis, chapter xxii—"And Abraham stretched forth his hand, and took the knife to slay his son. And Abraham lifted up his eyes, and behold behind him a ram caught in a thicket by his horns: and Abraham went and took the ram, and offered him up for a burnt-offering, instead of his son." The cast does not represent the knife and the figure on the altar so well as I could wish.

No. 3. Cornelian. A figure of Ceres, the style of execution almost equals the Apollo (No. 1.)

No. 4. White Cornelian. A well-cut head, Buddhist or Sassanian?

No. 5. Garnets. A head ornamented with earrings, and an inscription

round it. I imagine it to be Sassanian, for the peculiar character seems to resemble that found on some of the Sassanian coins, of which I send impressions ; it is evidently not Bactro-Pehlevi.

No. 6. Cornelian. A head coarsely engraved.

No. 7. Cornelian. A head apparently Sassanian, from the peculiar stile of head-dress, large pendant earrings, and moustache. The execution of this gem is particularly good.

No. 8. Garnet. A head of the same character as the last, and equally well executed.

No. 9. Cornelian. A bust, neatly and well engraved.

No. 10. Cornelian. A head, injured and coarsely cut.

No. 11. Cornelian. An animal with long ears or horns, from its hoofs probably intended for a stag.

No. 12. A Bronze Seal. I cannot make out the subject ; surely it is not intended for Apollo destroying the Python ? The figure is represented as trampling on the monster ; he holds the tail with his right hand, and there is something in his left, but whether an instrument of destruction is not evident.

No. 13. An Agate Seal, the figure of an Indian bull.

No. 14. A Bronze Ring. This is a very common device on the rings found at Beghrum. I have seen at least thirty with the same, and better finished than this.

No. 15. An Agate Seal. A coarsely executed bird of the genus *Anas*.

No. 16. A Copper Seal nearly effaced ; it appears to be Sassanian, and to represent a fire altar, with the two supporters.

No. 17. A Bronze Ring, affording some matter for speculation. A large bag of relics was brought to me from Beghrum, consisting of coins, pieces of brass ornaments, rings, &c. &c. I found amongst the lot at least fifty rings of various sizes and shapes, having on them this particular emblem or device.

No. 18. Cornelian. A horseman.

No. 19. A Bronze Ring which I found in the bag above mentioned ; the figure of Victory is in high relief ; it is purely Grecian, and is spiritedly and gracefully executed ; the impression does not do it justice.

No. 20. Another Bronze Ring from the bag, with the same device as No. 14.

GEMS FROM BEGRAM.



1



2



3



4



5



6



7



8



9



10



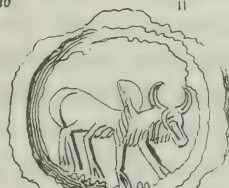
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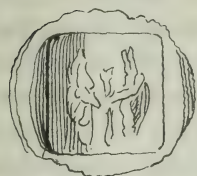
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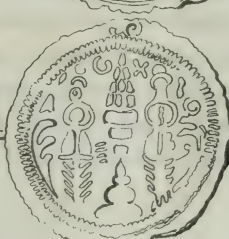
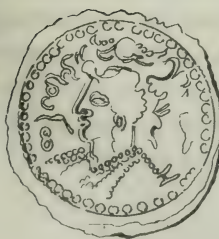
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19



20



Letter to the Secretary of the Asiatic Society, on the recent Cataclysm of the Indus, from DR. FALCONER, Saharunpoor, July 6, 1841.

MY DEAR SIR,—I have just perused in a letter from the frontier a brief and hurried account of some of the particulars of a grand Cataclysm of the Indus! certainly one of the most remarkable natural catastrophes hitherto recorded as having occurred on the continent of India, or any where else, in the deluge way. The details as yet are very imperfectly given, but they are of so intensely interesting a character, that I do not hesitate a moment to communicate them to you, in the hopes that the Government may do its best towards collecting authentic information, regarding the cause, extent, and effects of this flood. We all know how little impressed uncivilized nations are in the events of this kind : after the lapse of a few years, when the immediate effects have gone by, they are generally remembered only as imperfect traditions. The Government could with little trouble collect most of the desired information, through the political officers on the North-Western frontier ; but much will be lost in the authenticity and fullness of the particulars if any considerable delay occurs in making the inquiry. I am especially interested in the event, from being well acquainted from personal observation with the remote and little known tract in Thibet, which I believe to have been the great scene of operations on the occasion ; and I fancy I am the only person now in the country who has been there. Should the Government take the inquiry in hand, I will be most happy to give my humble aid in pointing out the kind of information desired, the situations where inquiry ought to be made, &c. and to work up the whole into a connected account, if desired.

You are well aware, from the descriptions of Burnes and other travellers, what a formidable river the Indus is near Attock. The depth was ascertained by Lieut. Wood, from actual measurement, to exceed many fathoms (I cannot at this moment quote the exact amount,) at the ferry between Attock and Khyrabad, notwithstanding that the velocity of the stream at this point is 9 knots an hour. It would appear that the river had been observed during *several months* past to be most unusually low, and to such an extent had the body of water lately diminished, that the deep bed at Attock was converted into an *easy ford* ! (I quote

the words used.) All at once this state of things changed, the river burst in an awful débâcle through the obstacles which had held up its water somewhere along the upper part of its course, and rushed down the valley in a mighty flood. The particulars regarding the effects, are probably derived from native accounts. The words of the letter are nearly thus: "*Hundreds of VILLAGES and TOWNS, including Khyrabad and Attock, were swept away, with thousands of human beings and cattle. The Lundaye, (or Cabul river, which joins the Indus, close above the fort of Attock,) had its water held up, and forced back so as to inundate the towns of Monshera and Akora (situated a long way up its course in the plain of Peshawur.) "In the Huzara country," probably between Durbund and Attock,) "the flood swept away artillery guns, with many hundreds of infantry and sowars; and old Sham Sing Atarewallah, a seik sirdar, had all his camp and followers carried down the stream, while he was himself, with a few troops, aloft pursuing the rebel, Paeouda Khan, (chief of Tuhaolee) through the hills. I have as yet only heard of the course of the inundation as far as Dera Ismail Khan, whence also the accounts are very distressing, and so they will continue to be I suppose, till it reaches the sea, for nothing else can contain it. But what must have been the condition of the unknown country flooded above the avalanche, since rumours of its fall have been prevalent for four months back? I conclude it must be the plains of Ghilgeet. The authorities on the Indus report the very foreign appearance of many bodies washing down."*

So much for the particulars already received, which are only sufficient to excite our interest about what remains to be known. Now so far as I am aware, there is no flood on record at all approaching this grand débâcle of the Indus; that of the Val de Bagnes, of which so graphic an account has been given by Basil Hall, was confined to one of the subordinate lateral valleys of the Rhone, while the flood of the Indus has in all probability washed its desolating career across the continent of India. The gigantic scale of its operations can be guessed from the facts above given. The town and fort of Attock are situated on a rock, well raised above the river. Yet the place is here described as having been swept away, with hundreds of the towns and villages! The inundation of Akora and Noushera, situated so high up the Cabul river, speaks volumes to the same effect; while the suddenness and unexpected nature of the catas-

trophe are emphatically told in the fate of Sham Sing's followers ! The drifting of artillery guns is quite a novel fact in geological operations of this sort : one would fancy, that it would require a good stiff current to walk away with a 24-pounder.

As to the cause, there can be little doubt but that it was occasioned by some unusual barrier temporarily established in the bed of the river somewhere high up its course, daming up its waters till they attained a volume too great for the strength of the obstruction. This may be fairly concluded, from what is said of the previous state of the ferry at Attock, which was in a great measure dried up. It is, you will observe, inferred that the stoppage occurred near the plains of Ghilgeet ; I suspect however, that it must have taken place much higher up, either on the "R-gem-tsoh," or united body of the Indus above Iskardoh ; or what is still more probable, on the "Noobra-tsoh" river, or Shayook above its junction with the Ludakh or great branch. During my stay in little Thibet, I, as well as Vigne, was able to settle the disputed geographical point, regarding which the statements and opinions of Elphinstone, Moorcroft, and Burnes, about the existence and point of confluence of two great branches of the Indus, are so conflicting. There are two great branches, the Southern or Ludakh river, along which Moorcroft descended ; and the Northern or "Noobra-tsoh" branch (Shayook of Burnes, &c.) the confluence of which, (seen by Vigne and myself,) takes place at Chundon, close to the castle of Kirrus, about a day's journey above Iskardoh, and a long way below "Duroz." During my stay at Iskardoh, I learnt from the Rajah Ahmed Shah, that great floods occasionally take place at irregular intervals, in consequence of the Noobra-tsoh river, (so called from the purgunna of Noobra through which it flows,) getting blocked up by avalanches and masses of ice. This river has one of its principal origins in a great lake, as yet unvisited by Europeans, in the Kara Korum mountains. After winter seasons of unusual severity the lake gets sheeted over with an enormous mass of ice, and the valley of the river below the lake is liable to be filled up with great avalanches of *ice* and snow. When events of this kind go together, the disrupted masses of ice from the lake, added to the avalanches, go on accumulating till a huge barrier is formed, which dams up the river, leading to tremendous floods when the water bursts through the obstacle. A case of this kind was des-

cribed to me by the Rajah, as having occurred within his recollection, attended with desolating effects along the valley of the Indus in little Thibet. The river rushes down in a mighty torrent, sweeping every thing before it. Further I learnt at Attock, when going over the fort in 1837 with Burnes, that such heavy floods have been known in the river there, that the water has risen over the top of the "*Ab-doord*" bastion, perhaps 30 feet high, which insures the supply of water for the fort if besieged, and the base of which is usually almost on a level with the surface of the current. But I was not above to connect the two events as coincident in time of occurrence.

I do not think it at all likely that the obstacle occurred any where below Iskardoh, both from the configuration of the valley of the river, and from the difficulty of conceiving a barrier of snow or ice to be formed so low down; whereas higher up, on the Noobra river, avalanches are so common, and on so grand a scale, that it is easy to conceive the river being blocked up: and the temperature of the water is so low, that its action in the way of melting the ice would be very slow and partial. This objection appears to me to apply to the whole of the united river, as far up as the junction of the Ludakh branch. The "*very foreign appearance of the bodies washed down,*" would indicate them to be at least from as high up as little Thibet, for the people of Ghilgeet and the "*Dardohs*" of that neighbourhood, are very much like the Pathans above Attock. The Chinese style of features first commences in and above little Thibet.

But these ideas at the best are merely conjectural, and I only advance them, with the object of guiding the direction of the inquiries. If the river really was so low at Attock as to be in the state of a practicable ford, it would seem to follow that the obstruction must have affected both branches of the Indus: for otherwise, the Ludakh river is large enough to supply of itself a large volume of water. The cause in that case would probably be found in a land-slip, or something of that kind, or mountain masses precipitated by an earthquake. An event of this sort is not improbable, for we know that in 1809 an earthquake of such force took place in Gurwah, that the Bishnoo Gunga river, one of the great branches of the Ganges, was blocked up below Goseenauth by a land slip, and the water rose to 40 feet above its usual level.

The points from which the best information may be expected, are Iskardoh in little Thibet; from Rajah Jubbar Khan, of Astore or Hussorah, in the Dardoh country, opposite Ghilgeet, where the Indus makes its great bend to the south; then from Jalkot in the Dardoh country, Durbund, Torbeila, Attock, Calabaugh, and the Derajats. The greatest effect of the flood will probably have been felt in the neighbourhood of Iskardoh; then near the low plains of Huramosh, G6r and Poorijee near Ghilgeet, where the river bends to the south; next at Durbund and Torbeila, where the effects must have been very great; then at the point where the Indus escapes from the hills into the plain of Chuch; then at Attock, and then at Calabaugh, where the river escapes from the salt range.

A few days more will likely put us in possession of many more authentic particulars derived from the whole line of the Indus, and should the flood turn out to have been really as grand and important an affair as appears from what we know at present, some inquiry regarding it should be instituted by those who have the power. The following occur to me as some of the most prominent points to be inquired into—the nature, cause, situation, amount, and date of the obstruction; length, breadth, and depth of the lake formed: and length of time occupied in its collection; date of the first perceptible subsidence of the river at Attock; and greatest amount of reduction estimated in decrease of depth, and if possible, in cubic feet of discharge per second, contrasted with average discharge; cause, period of, and “*modus operandi*,” of the yielding of the barrier.

Date of the débâcle arriving at different points along the river, and period of its continuance; volume of water discharged in cubic feet per second; velocity and depth of the current; greatest rise of water at different points; appearance, colour, consistence, and temperature of the water; extent of the inundation; amount and nature of the effects produced, in the destruction of land and loss of human and animal life; number and names of towns and villages destroyed; with particulars of any remarkable changes in the physical configuration of the tract through which the flood passed; date of subsidence at different points; appearances observed, and effects produced in the Delta of the Indus, during and after the flood; in the stranding of carcasses, animal or human; timbers; boats; amount of deposit;

silting up or clearing out any channels of the river previously navigable, or the reverse, &c. &c.

HENRY TORRENS, ESQ. &c. &c. *Calcutta.*

This letter was laid before the Governor General, when, with the usual kindly interest evinced by His Lordship on all scientific subjects, assurances were given, that occasion would not be lost sight of, for the purpose of making due inquiry into the causes of the phenomena described. Lord Auckland indeed addressed Mr. Clerk, (Gov. General's Agent, N. W. frontier), at length on the subject; but before the letter reached its destination, Mr. Clerk had already deputed Dr. Jameson, Civil Surgeon at Umbala, and for sometime our officiating Curator, for the purpose of inquiry. The results of this interesting mission will be anxiously looked for.



*Note on the Fossil Jaw, sent from Jubbulpore by DR. SPILSBURY. By the
Acting Curator, MR. PIDDINGTON.*

At the request of our Secretary, I add the following remarks to those of Dr. Spilsbury on this fossil. I could wish the task had fallen into the hands of one qualified to draw inferences, which I cannot venture upon doing, but must content myself with stating facts as I observe them.

Since Dr. Spilsbury's note was written I find that the matrix (which is unfortunately a very hard conglomerate of rolled pebbles in a paste of coarse calcareous sandstone) has been chiselled off, so as to clear the side faces of the molar plates more than is seen in Dr. Spilsbury's drawing. I proceed to remark on the peculiarities which the fossil in its present state presents to an inexperienced eye, and on comparing it with both recent and fossil crania in the Museum. In its general appearance the remarkable differences are,

(1) The narrowness of the teeth; (2) the deep sulcus formed by their great protrusion below the palatal bone; (3) the closeness of the plates of the teeth, and the angle formed by the molars and incisors, which cannot be distinguished as separate with the posterior part of the jaw; (4) the transverse breadth of the jaw at the point where

G. C.
m/ne



Length $\frac{F}{2} - \frac{J}{14}$
 Breadth 11

A to B. extent of Teeth about 18 Inches

C. Matrix chiselled off to show the fangs or roots some 11 In. deep

A to D. Teeth rather injured, not so perfect as D to B

E to F. Matrix entirely cleared off

G about this some appearance of the Foramen Magnum but could not make out the Condyles.

N.B. Breadth of the Teeth about those of a Fossil Elephant and of the same structure.

J. Gibbs Delt
mp. near Hursingham.
6th February 1838

the arch above the teeth rises to the side of the curved alveola of the tusks and the suborbital part of the malar bones; (5) the length of the jaw. I take these peculiarities in the order in which I have mentioned them.

1. *The narrowness of the teeth.*—Upon comparing our fossil with two fossil skulls, both I believe from the valley of the Nerbudda, and three recent ones in the Museum, I find the following dimensions as to breadth of the teeth:—

			Incisor.		Molar at the ridges.
THE FOSSIL,	...	...	2.8	...	... 2.4
A. First Fossil Skull (perhaps Mastodon Elephantoides,.	}		3.1	...	... 3.5
B. Second,	...	...	3.0	...	... 3.2
Recent Skulls ordinary size,	}		3.1	...	... 2.9
1st	...	...	...	...	...
2nd	..	..	...	...	.. 3.1
Large one,	...	..	3.8	...	... 3.9

It will be seen that Cuvier, whose note I copy at pp. 624, 625, says that the breadth of the teeth of the fossil elephant (speaking of that of Siberia) is greater than that of the teeth of the* modern Indian elephant, the fossil ones being from 0.08. (3.3 Ins. Eng.) to 0.09 (3.7 Ins. Eng.) while the recent ones are from 0.06. (2.7 Ins. Eng.) to 0.07 (3 Ins. Eng.) In connection with other measurements of length and breadth, this variation in our fossil seems of much import.

2. *Depth of the sulcus formed by the teeth and palate at its deepest part.*—I cannot distinguish that any part of the palatal bone has been chiselled away, and thus I assume this remarkable difference to exist. I measure it at the deepest part I can find, which is generally near the angle.

Depth from face of teeth to palate.				
		Inches.		
THE FOSSIL,	...	4.0	...	and some matrix apparently remaining.
A. First Fossil Skull,	}	1.0	..	palate perfect.
perhaps Mast. Elephantoides?... ..				
B. Second.	... ..	2.4	...	palate perfect.

* Taking, as will be explained, (§ 3), the posterior plates or part of them to have been used as molars.

Depth from face of teeth to palate.

		Inches,	
Recent Skulls,	1st.	3.7	} ... palate perfect.
ordinary size,	2nd.	3.8	
Large, ...	.	5.8	

The breadth of this sulcus may also be of importance in the few dimensions we have for comparison: they are as below:—

		Greatest breadth of sulcus.			Breadth at front of the incisors.
		Inches.			Inches.
THE FOSSIL,	...	4.4	...	...	1.7
A. First Fossil Skull,		3.0	...	...	1.2
B. Second,	...	4.8	...	...	2.8
Recent Skulls,	1st.	4.9	...	...	2.4
ordinary, size,	2nd.	3.3	...	...	2.8
Large one,	3rd.	3.2	...	...	2.7

3. *The closeness of the plates of the teeth, and the angle formed by the molars and incisors.*—A space of two inches measured on the perfect part of the incisor included on:—

THE FOSSIL,	...	8 ridges or	...	...	plates.
A. First Fossil Skull,	5	..	...	...	2½,,
B. Second,	...	5	...	...	2½,,
Recent Skulls,	1st.	6	...	...	3,,
ordinary size,	2nd.	8	...	...	4,,
Large one,	...	6	...	...	3,,

4. *The angle formed by the molars and incisors.*—I have called this so, because in our fossil, to all appearance the incisors occupy what may be termed the horizontal plane of the jaw, and the series of plates, which in the recent elephant form the posterior part of the molars, called by Cuvier Os. Fossils, pl. 9. fig. 2, *lames osseuses dont l'ensemble doit former la dent*, seem to have partly constituted the molars; for they are perfectly ossified, and though in the chiselling the top has been taken off, it is difficult from the texture (which by the way is not at all mineralized but truly ossified) to suppose that they cannot have been in use, or that the animal could have managed with only the 4 or 5 inches of narrow incisor or molar, which now present a flat surface.*

* Supposing always that the length and the breadth of the jaw at the rise of the facial arch, as hereafter noted, does not allow us to consider it as that of a young animal.

A. The Folioil

B. From "Litho"
Currier

C. Mastodon Elephantidae?

Mus. Ac. Soc.

D. Recent

Skull. Mus.

E. Large recent

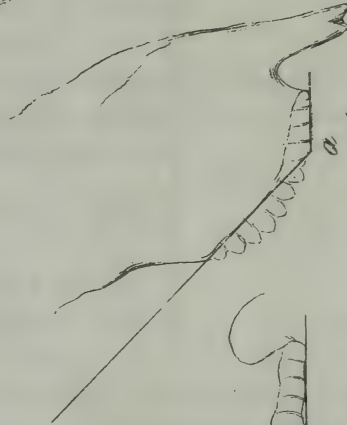
Skull. Mus.



a 510"



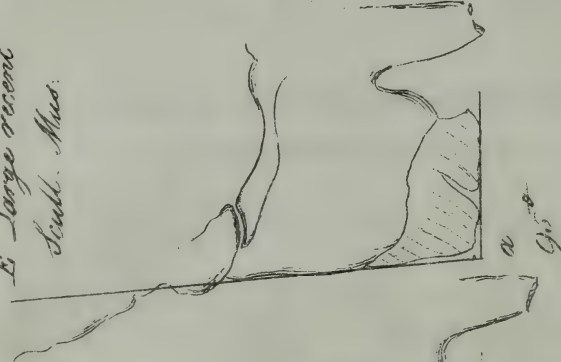
a 122"



a 136"



a 100"



a 95"

Three folioil and two recent jaws, to illustrate remarks on Dr. Spillburg's
folioil jaw from Jubbulpore

H. P. det.

What I mean, however, will be best shewn by the sketches in the plate, where—

A, is the Fossil: the angle at *a* being 110° .

B, Fossil head from Siberia (Cuvier Ossements, F. pl. viii. fig. 1.) angle at *a*, 122° .

C, first Fossil Skull, Mus. As. Soc. perhaps Mastodon Elephantoides, angle *a*, of which one branch is the chord of the arc formed by the molars, 136° .

D, First recent Skull, No. 1 of the foregoing measurements angle *a*, 100° .

E, Large recent skull, No. 3 of foregoing measurements angle *a*, 95° .

In the plate the fossil A, with C D and E are drawn to the same scale, in B. from Cuvier there is no scale mentioned.

I have already alluded to the number of the plates in the incisor or horizontal part; in the posterior part of the jaw I should mention that they are separated by a soft, white, powdery mass, which easily gives way (much like chalk) to the knife; the plates themselves are hard, bony-like, and brittle, their length is about six inches, and on the most perfect side there are 21 plates in a space of $12\frac{1}{2}$ inches, all perfectly defined. In a recent skull I find 13 plates in a distance of 9 inches, which would give but 18 for $12\frac{1}{2}$ inches, and they are all loose, and so soft, as to yield to a slight touch of the tool. In a word, our fossil seems to have had these as true teeth, and not as germs, as in the modern elephant.

4. *The transverse breadth of the jaw.*—As this dimension is fortunately obtainable, I have thought it should not be neglected, as tending to throw light upon the question of the animal's age. As before mentioned, it is measured at that part of the incisive bone, where the arch rises. It should be remarked, that not being taken from a fixed point, it is, in so far, an approximative measurement depending on the accuracy of the eye in fixing upon nearly the same part of the arch as that which is taken in the fossil. The comparative dimensions are as follow:—

					Breadth of the jaw.
					Inches.
THE FOSSIL,	...	...	...	...	10.4
A. First Fossil Skull as before,	...	...	...	...	11.1
B. Second,	...	...	...	...	imperfect.

			Breadth of the jaw.
			Inches.
Recent Skulls, 1st.	...	...	10.8
ordinary size, 2nd.	...	...	9.1
Large size,	...	...	12.5

5. *The length of the jaw.*—This dimension should perhaps be called its depth. I mean by it a direct line from the centre of the foramen magnum to the front of the incisors (B. plate 1.) In our fossil we have not been able to find the trace of the foramen magnum; but we have cleared away enough, I think, to warrant our saying, that if perfect, the depth of the jaw (or length as expressed above) would be quite what the fossil now is. The following are the measurements:—

			Feet.	Inches.
THE FOSSIL, about,	2 0
Fossil Skulls,	imperfect.
Recent Skulls, 1st....	2 2
Ordinary size, 2d.	2 1
Large size, 3d.	2 7

From the foregoing measurements, the peculiarities of this fossil may I trust be elucidated. I cannot venture, with my limited knowledge of the subject, upon drawing inferences. The following passages from Cuvier may perhaps be of use, to those who have not the work at hand; and apart from the earnest desire both of Mr. Torrens and myself, and I am sure of every member of the Society, to see justice done to so steady and active a contributor as Doctor Spilsbury, to whom the Geology and Paleontology of India is so greatly indebted; the last one may serve in some degree to explain why we have thought it just to him that every thing relative to this fossil, should it prove new, should be placed upon record. It is no small encouragement to the pioneers in every walk of Natural History, to learn, from the hand of Cuvier himself, that it is to a single memoir and plate, which had been neglected for seventy years in the Philosophical Transactions, that we owe the most magnificent series of discoveries, which have yet illustrated the former state of our globe!

Museum, 31st July, 1841.

H. PIDDINGTON.

Notes from Cuvier.

Os. Foss. vol. i. p. 522.—I. “On a disputé sur le nombre des dents des éléphants: la Société Royale de Londres s’aperçut en 1715 qu’il

varie d'une a deux de chaque coté, et que la place de la division varie aussi ; c'est à dire que la première dent est plus ou moins longue, à proportion de la seconde, suivant les individus.—Trans. Phil. Tome xxix, No. 349, p. 370.”

Vol. ii. p. 177.—II “ Mais le nombre (des lames des dants) pris sur des dents de longueur égale ne donnerait-il point de bons caractères ? c'est ce que j'ai examiné sur un grand nombre de dents des *Indes* et *fossiles* et j'ai presque toujours trouvé les lames de ces dernières plus minces, et par consequent plus nombreuses dans une même espace.”

Vol. iii. p. 178.—“ Un troisième caractère est pris de la largeur, tant absolue que proportionnelle, des dents ; beaucoup plus considerable dans l'éléphant fossile que dans celui des Indes. On peut s'en assurer par la cinquième colonne de ma table : où l'on voit que les fossiles ont presque toutes de 8.08 a 9.09, de largeur ; et les dents du vivant de 0.06. a 0.07.”

* * * * *

Vol. iv. p. 180.—“ Ainsi on ne peut pas considerer la minceur des lames comme un caractère de l'éléphant fossile aussi général que la largeur de ses dents, et que les formes de ses machoires et de son crâne ; cependant la largeur seule de ses machelières suffit pour les reconnaître, parcequ'elle est beaucoup plus constante.”

P. 199.—Speaking of three fossil skulls, brought from Siberia, from the banks of the Indighirska, by the intrepid Danish traveller Messerschmidt, who gave a drawing of the best of them to Breynius, who engraved it to accompany a memoir inserted in the Philosophical Transactions. (It is that from which the outline B. in our plate is taken,)

he says, p. 201 : “ Dès que je connus ce dessin de Messerschmidt, et que je joignis aux différences qu’il m’offrait celles que j’avais observées moi-même sur les mâchoires inférieures, et sur les molaires isolées je ne doutai plus que les *éléphants fossiles* n’eussent été d’une espèce différente des *éléphants des Indes*. Cette idée que j’annonçai à l’institut dès le mois de Janvier 1796 m’ouvrit des vues, toutes nouvelles sur la théorie de la terre ; un coup d’œil rapide jeté sur d’autres os fossiles me fit presumer tout ce que j’ai découvert depuis, et me détermina à me consacrer aux longues recherches et aux travaux assidus qui m’ont occupé depuis vingt cinq ans.

Je dois donc reconnaître ici, que c’est à ce dessein, resté pour ainsi dire oublié, dans les Transactions Philosophiques depuis soixante dix ans que je devrai celui de tous mes ouvrages auquel j’attache le plus de prix.”

P. S.—Since this paper was written, I find in the Society’s collection a strong corroboration of the surmise, that our fossil was an adult animal. A lower fossil-elephant’s jaw, sent down by Mr. Conductor Dawe from Nahun, has the teeth, (or tooth, for there seems only one,) of exactly the same breadth as our fossil. The whole length of it is 6.9 inches, of which only 4.5 inches are worn down, the remainder standing up 0.8 inches above the rest, as if it had not been brought into use. In 2 inches, there are 7 ridges of enamel ; our fossil having as will be recollected 8 ridges.

The dimensions of this lower jaw, compared with those of the lower jaw of our largest recent elephant (E of the plate,) are as follow :—

	Large recent Elephant, E. of the plate. Inches.	Jaw from Nahun. Inches.
Depth of lower jaw from the crown of the worn teeth to the lowest part of the arch of the jaw,	8.0	8.9
Thickness of the jaw at the thickest part,	7.4	5.8

TEETH.

Entire length, (2 teeth,)	11.0*	6.9
Worn surface, (1 tooth,)	11.0	4.5
Projecting,	0.0	2.4

From hence it will be seen, that we have, from two spots at least 600 miles apart,—our fossil being from the banks of the Nerbudda, and Mr. Dawe's from Nahun, on the banks of the Delhi Canal,—the remains of a race of narrow-toothed fossil elephants.

* All more or less worn.

Notes on Fossil Discoveries in the valley of the Nerbudda. By G. G. SPILSBURY, Esq.

In continuation of my notes on the fossils of the Nerbudda valley, I beg to forward for presentation to the Society another series of drawings from the same able friend's pencil, and without whose cheerfully accorded aid, I should have little chance of being either intelligible or interesting.

A. is a set of six specimens drawn to the same scale.

No. 1. I had set down as that of the humerus of a buffalo, but am doubtful, from its answering almost completely in dimensions to a similar bone delineated in Captain Beechey's voyage as that of the Musk Ox; and to shew the great resemblance, G is the reverse drawing of No. 1 for comparison with Captain Beechey's, made to his scale and delineation.

No. 2. Is a portion of the femur of a similar animal.

No. 3. Portion of femur of elephant.

No. 4. Tooth of hippopotamus.

No. 5. Part of lower jaw of an elephant.

No. 6. Sacrum with last lumbar vertebra of some bovine animal.

B. No. 7. Lower jaw of a wild hog, and C. No. 7. in the next plate, is a somewhat different view of the same specimen.

No. 8. Part of the lower jaw, tusks, and teeth, imperfect, of the hippopotamus.

D. No. 9. Dexter half of the lower jaw of an animal of the deer kind.

No. 10. Portion of upper jaw and teeth of a deer.

E. Posterior molars of a hippopotamus.

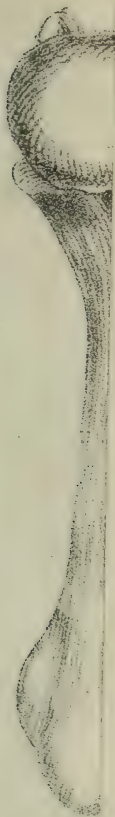
F. Two drawings, frontal *a*, and occipital *b*, of a horned animal remarkable for the little depth of the skull, from the point at *b* to the condyles of the occiput being scarcely two inches; *c d* are reversed views of the chin of the hippopotamus; the original of which has been forwarded for presentation to the Museum, accompanied by seventeen other specimens.

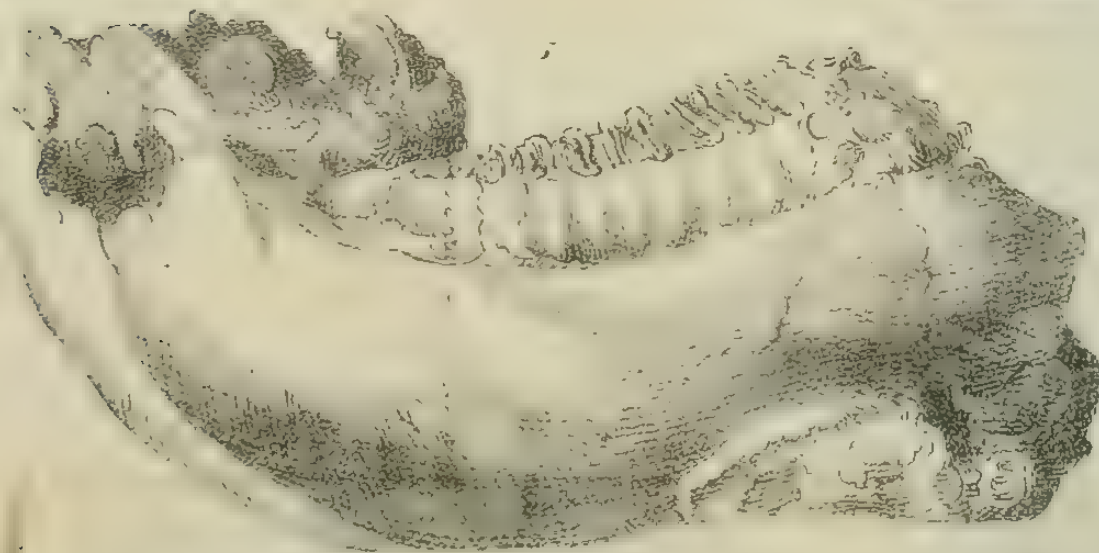
Of the various sites and localities from which the foregoing have been derived, a few remarks may be necessary. They occupy a space (generally on the banks of the Nerbudda) from some miles above Jubbulpore down to Brimhan-ghat, a distance of at least eighty miles by

Nos

A

7



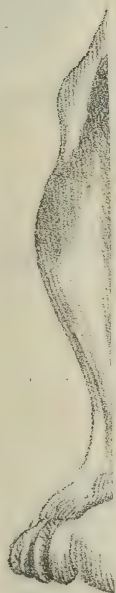
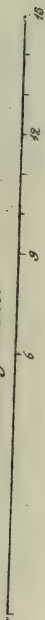


P. A. Reynolds del.



Scale of Inches

Scale of Inches



Q

B

γ

α

Scale of Inches
0 1 2 3 4 5 6 7 8 9 10

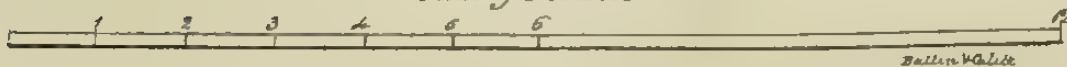


δ



P. A. Reynolds del.

Scale of One Foot

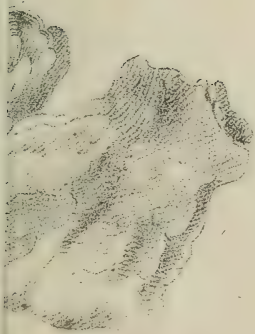


E



3 4 5 6
Scale of Inches

C



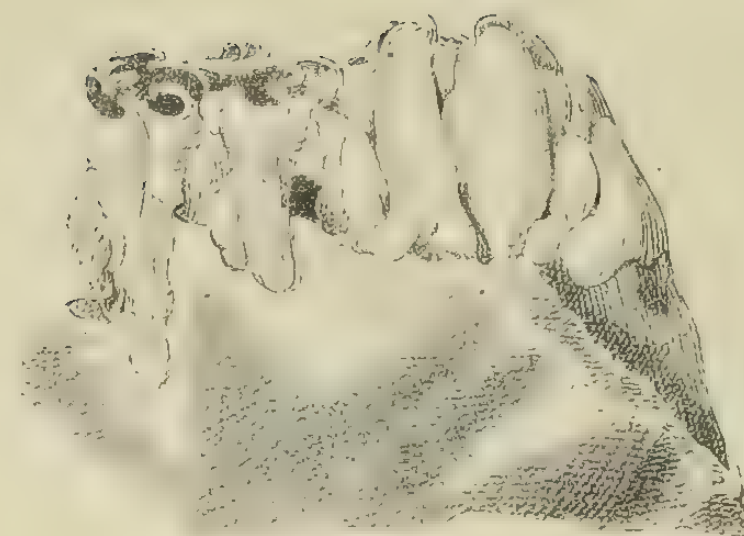
12

E

D

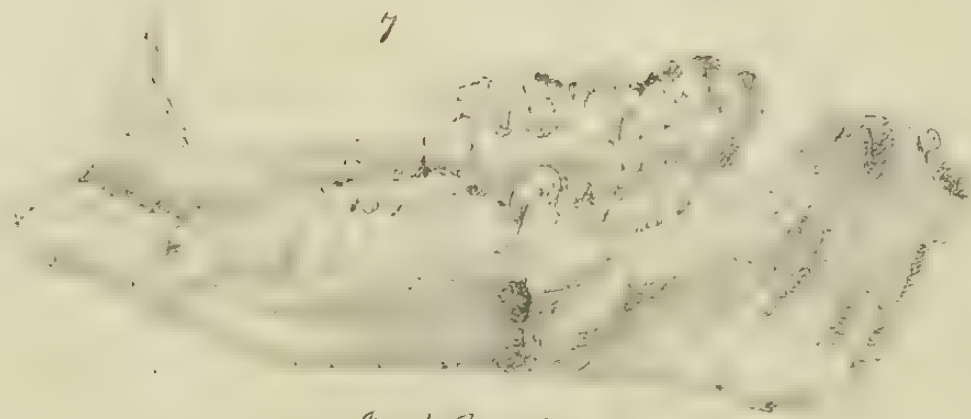


Scale of Inches



Scale of Inches

No 10

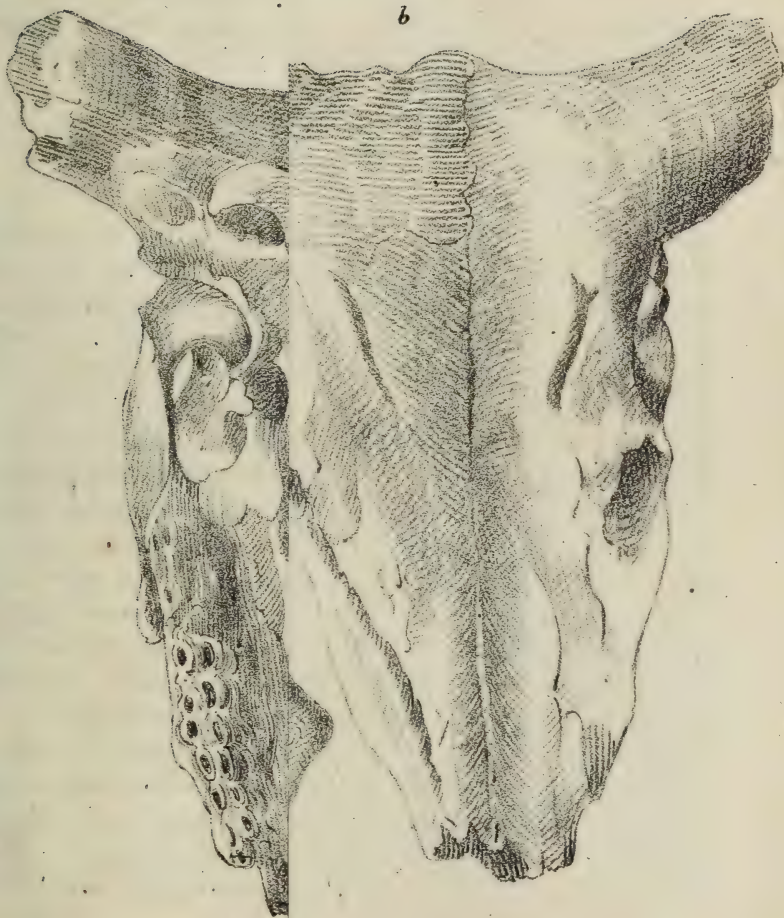


Scale of one foot

J. A. Reynolds del.

F

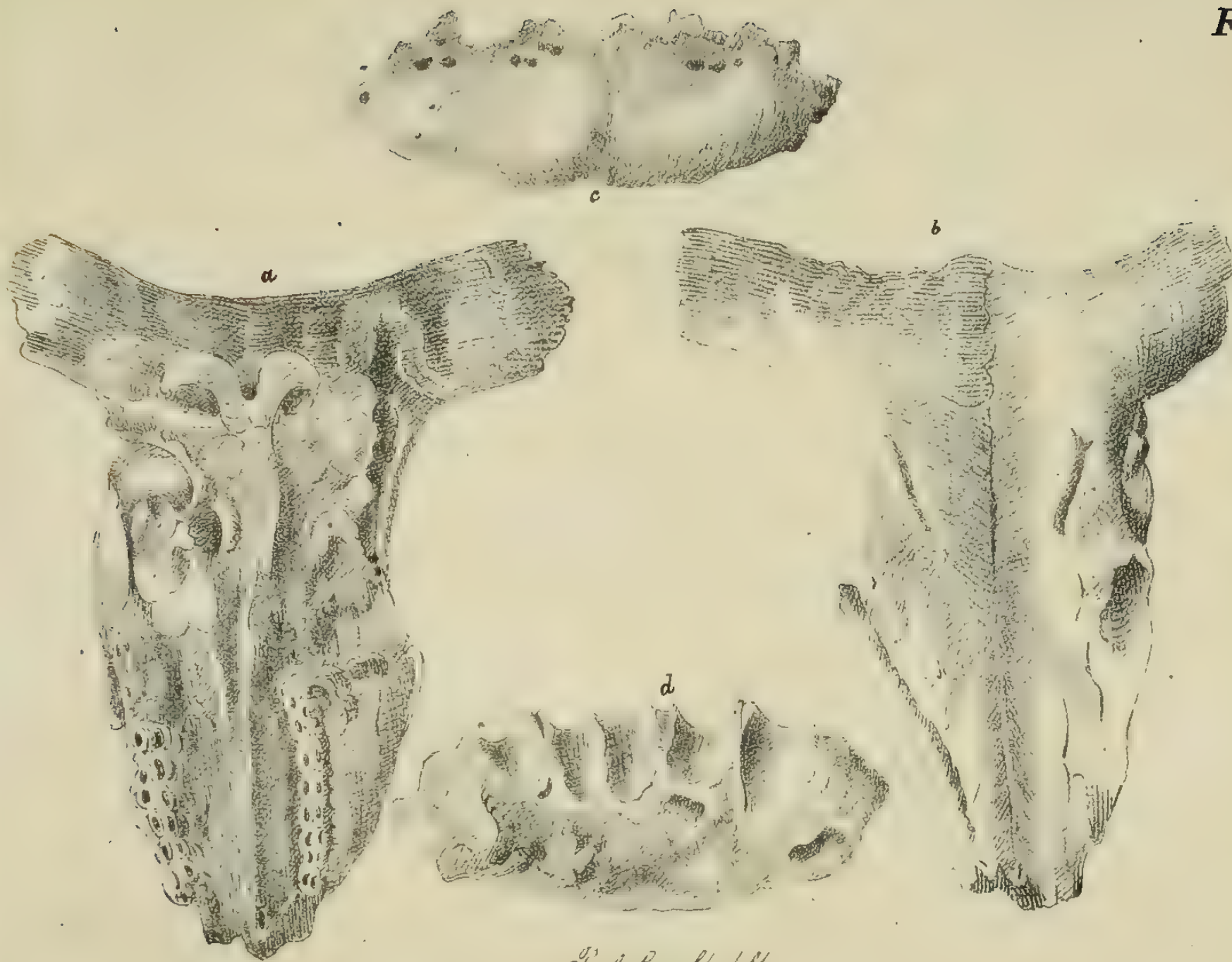
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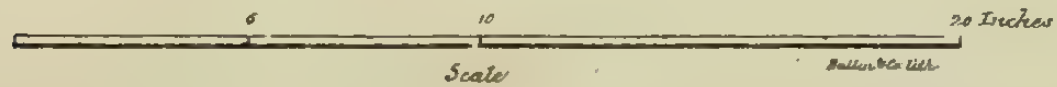
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Buller, & Co. Lith.

F



J. A. Reynolds del.



the course of the river. The specimens of hippopotamus have chiefly been from the vicinity of Deo Pachur, from whence the huge specimens of the elephant, now in the Museum, were sent in November 1833, and an account published in the Journal of the Society, for August 1834. In addition to these, some few traces of turtle have been brought in, but no specimen of any carnivorous animal has as yet been found among the numerous graminiferous classes.

Camp, Gov. Genl. Agent at Rewah,

14th February, 1840.

Remarks by DR. T. R. ROTH.

Calcutta, January 18, 1841.

Returning to you with many thanks the drawings of fossil bones which you had the kindness to communicate to me, I embrace this opportunity to draw your attention on that figure which is marked B. No. 8, and by the learned gentleman who did send it, supposed to be the lower jaw of an hippopotamus. I own I was myself in the first time led to the same opinion by the very singular shape and breadth of the whole, and the situation of the tusks; but when I counted the teeth, and found 3. 1. 7, and much more, when I observed the small distance of the first molar from the tusk, and the shape of the last molar, I was not more at a loss; for all that shews me, that I have before me the jaw of a species of *Palæotherium*, which will very likely prove to be a new one, because it differs from all species known till now, by the obtuseness and breadth from one tusk to the other. I would suggest that you should induce your correspondent to send either more detailed drawings, or the specimen itself if possible, for further examination.

Fig. *a* and *b* I consider myself as a most extraordinary skull. The proportion of the margo orbitalis externus (posterior) to the tuber frontalis of the horn is like that of the *Bos Grunniens*; but the small height of the skull is very singular, and worth a full and accurate description.

d g and *n* I suppose are remains of two different species of Antelope. B 7 and C of *Sus*. E surely of hippopotamus; but whether A 4 belonged to an individual of the same kind I cannot tell at present.

Let me entreat you, Sir, to prevail with the gentleman, your correspondent, to submit rather the specimen, than drawings; for although, these now before us are beautifully executed, yet they want very much as to supply the specimens themselves.

I am directed by Herrmann de Meyer, Esq. of Frankfort on the Main, author of the "Palæologica," and other valuable geological works to distribute among the geologists of the Honorable Asiatic Society of Bengal, the prospectus of a new intended work, "Fauna der Vorwelt" (Faune of the former age.) The name of the author will be sufficient to shew what is to be expected by his genius and able pencil.

NOTE.—This prospectus is printed with this No. as an advertisement, and will continue so to appear till further notice.



Catalogue of the Birds in the Museum of the Asiatic Society. By J. T. PEARSON, Surgeon, formerly Curator of the Museum.

NOTE.—I cannot omit this opportunity of thanking Mr. C. W. Smith, for the kindness with which he has lent me his Notes, to which I am so largely indebted in the following Catalogue.

J. T. P.

No. 1.

Class AVES.

Order RAPTORES.

Fam. FALCONIDÆ.

Genus HALIÆTUS.

Sp. *H. Leucogaster*.

White bellied Eagle.

A specimen sent from the Chinese collection lately broken up at Macao: a portion of which, consisting of the animals mentioned in this and other branches of the Catalogue, was sent to the Museum of the Asiatic Society by Mr. Inglis.

2. *Haliæetus Ponticerianus*.—Pondicherry Eagle.

Shot by the Curator, near Calcutta, and mounted in the Museum.

Falco Ponticerianus.—Gmelin's Lin. I. 263 Turton's Lin. I. 150.

Pondicherry Eagle. Latham's Gen. Hist. I. 147. Shaw's Gen. Zool. VII. 91.

Haliaeetus Ponticerianus. Stephens' continuation of Shaw's Zool. XIII. Part II. 13.

"Europeans have given this bird the appellation of *Brahminy Kite*, which originates probably in having observed that the Hindoos attach superstitious ideas to it. Among the Mahommedans there is a prevalent notion, that when two armies are about to engage, the appearance of one of these birds over either party, prognosticates victory to that side; thence its Arabic name of البنقا محم

"These birds are among the first objects which attract the eye of a stranger, for they swarm about the shipping at Calcutta, and are useful in removing any offal which may be thrown overboard; but though their usual food is carrion, yet they kill fish, and not unfrequently carry off a snipe which the sportsman has levelled."—*C. W. Smith's MS. Notes.*

The *Brahminy Kite* is a handsome bird, of an elegant form, and striking plumage; the rich red-brown of the back contrasting well with the white of the head, neck, and breast, the black of the quill feathers, and the yellow beak and legs. As Mr. Smith has stated, it is common at Calcutta; it is met with in the interior of the country, but not so often as at that place. At Garden Reach, the species is often observed in pairs, perching on the stump, or branch of a decayed tree; and numbers of them are to be seen flying over the Hoogly. It is perhaps possible, that there may be something like migration in the habits of this bird. I have thought that at some periods of the year it is more common than at others: in the cold season it abounds, while in the rains, it is rarely met with. Lieut. Montriau, of the Indian Navy, to whom I am indebted for much information on Indian Zoology, informs me, that it is rarely seen at Saugor in the cold season.

4. Genus ACCIPITER.

Sp. A. Fringillarius.—Sparrow Hawk.

Shot at Garden Reach, and mounted in the Museum.

5. *Accipiter*—? Chippuck Hawk.

Shot by the Curator at Garden Reach, and mounted in the Museum.

This bird is called *Chippuck* by the natives.

6. Gen. *IERAX*.Sp. *Ierax*.—Cohy Falcon.

Chinese collection *Cohy Falcon*, Lath. Gen. Hist.

“This is a scarce bird, it was sent to me by a native gentleman residing at Thekaree in the Gya district, who accompanied it by a note, in which he acquainted me, that a bird of the species had not been procured more than once in the memory of the oldest *shikaree*; and that it was thought to be a most auspicious circumstance to find one on the estate. This is the Cohy Falcon of Latham, whose figure of it is execrable, and it there appears any thing but a beautiful species. I observe that the chesnut plumage on the wings and scapulars of his bird, is not to be found in the present subject.”—*C. W. Smith's MS. Notes.*

The Cohy Falcon is one of the most beautiful of the Falcon race; and you perceive at once that it is a high caste bird. Its posture is erect, its plumage glossy, form compact, and manner dauntless: while the crest on the head adds much to its grace and beauty. One was brought to me while at Midnapore, by a *shikaree*, or bird fowler; but I had not the heart to kill it, and after having kept it for some weeks, it broke from its perch and flew away. All my endeavours to procure another specimen were vain. Dr. Evans has one stuffed, and in good plumage, (which that belonging to the Society is not,) and in both these, the chesnut plumage mentioned by Mr. Smith as wanting in his specimen, is present: it may depend upon the sex or age of the specimen. The figure in Latham is certainly a very bad one; and gives no idea of the beautiful bird the Cohy Falcon really is.

7. Fam. STRIGIDÆ.

Genus *STRIX*.Sp. *Flammea*.—Barn Owl.

Presented by P. Homfray, Esq. and mounted in the Museum.

Strix Flammea, Lin. Syst. Nat. I. 133. Turton's Lin. I. 171. Gmelin Lin. I. 293. Shaw's Gen. Zool. VII. 258. Stephens. XIII. 60.

Barn white Owl. Latham's Gen. Hist. I. 355.

Chouette effraie. Dict. Classique D'Hist. Nat. IV. 80.

"I found this bird in the dilapidated ruins about Boodh Gyah, and subsequently other specimens near Hadjipur, Tirhoot. It does not appear to differ from the white Owl of England."—*C. W. Smith's MS. Notes.*

Mr. Homfray's specimen was procured at Howrah.

Dr. Horsfield has named this bird *Strix Javanica*, thinking it different from the European species. And the compiler of the Catalogue of Col. Sykes' collection from the Duckhan, published in the proceedings of the Zoological Society for 1832, page 82, states, that "a comparison of several specimens with the European bird satisfies Col. Sykes, that Dr. Horsfield was right in separating it. Neither sex is unspotted beneath, nor has the Indian species a white disc."

8. Order INSESSORES.

Tribus. FISSIROSTRES.

Fam. MEROPIDÆ.

Genus. MEROPS.

Sp. M. *Viridis*. The green Bee-eater.

Presented and mounted by M. Bouchez. *Merops Viridis*. Syst. Nat, I. 182. Turton's Lin. I. 284. Gmelin Lin. I. 460. Shaw's Gen. Zool. VIII. 156. Stephen's XIII. 73. Latham. Gen. Hist. III. 122.

"These birds are very numerous throughout India, their time of incubation is the month of June, and for months after they are hatched, the whole brood congregate, and swim about with the swiftest and most entire movements through the air, making short dips and returning to the topmost twig, from which they took flight: during these evolutions they are busily employed in snapping up the insects."—*C. W. Smith's MS. Notes.*

The green Bee-eater has the power of gliding along for some distance without closing its wings; so that its flight consists of two parts, —a rapid commencement, in which the wings flap rapidly, and a quick glide, with the wings and tail fully expanded. Its motion, especially in this latter position, is extremely elegant; and its bright, almost metallic plumage, shining in the evening sun, gives one the idea of a very beautiful butterfly rather than of a bird.

9. *Merops Castaneus*. Chesnut Bee-eater.

From the Chinese collection. *Chesnut Bee-eater*, Latham Gen. Hist. 4, 144, *Senegal Bee-eater*. Shaw. Gen. Zool. VIII. 163.

Guepier D'Adanson, Dict. Class. D'Hist. Nat. VII. 579.

10. *Merops*——?——Bee-eater.

From the Chinese collection, perhaps the female of the last specimen.

11. Fam. HIRUNDINIDÆ.

Genus CYPSELUS.

Sp. *C. Palmarum*, the Balearic Swift.

Shot by the Curator, and mounted in the Museum.

* Figured in Hardwicke and Gray.

12. Fam. CAPRIMULGIDÆ.

Sp. *C. Asiaticus*.

Bombay Goat-sucker.

From the Chinese collection. *Caprimulgus Asiaticus*, Turton's Lin. I. 636. Shaw. Gen. Zool. X. 156.

Bombay Goat-sucker, Latham. Gen. Hist. VII, 337.

Engoulevent de Bombay, Dict. Class. D'Hist. Nat. VI. 167.

13. Fam. TODIDÆ.

Genus EURYSTOMUS.

Sp. *Eur. Orientalis*. Oriental Eurystomus.

From the Chinese collection. *Coracias Orientalis*, Shaw. Gen. Zool. VII. 403, Latham. Gen. Hist. III. 77.

Colaris Orientalis, Lin. Trans. XIII. 162.

15. Fam. HALCYONIDÆ.

Genus HALCYON.

Sp. *H. Atricapilla*. Black-capped Kingfisher.

From the Chinese collection. *Alcedo Atricapilla*, Gmelin. Syst. Nat. I. 453. Turton. Lin. I. 279. Latham. Gen. Hist. IV. 30. Shaw. Gen. Zool. VIII. 70.

Martin Pêcheur de la Chine. Dict. Class. D'Hist. Nat. X. 227.

Halcyon Atricapillus. Stephens, XIII. 99.

15. *b*. Another specimen from the Chinese collection.

16. *Halcyon Smyrnensis*. Smyrna Kingfisher.

From the Chinese collection.

17. Another specimen presented and mounted by M. Bouchez.

18. Another specimen, shot by the Curator, and mounted in the Museum.

Alcedo Smyrnensis. Lin. Hist. Nat. I. 181. Gmelin. Lin. I. 459. Turton's Lin. I. 282. Shaw's Gen. Zool. VIII. 68. Latham's Gen. Hist. IV. 18. Griffiths' Cuvier, VII. 410.

Martin Pécheur bleu et roux. Dict. Class. D'Hist. Nat. X. 227.

Halcyon Smyrnensis. Stephens' Shaw's Gen. Zool. XIII. 99.

"This bird is common throughout India, it is likewise possessed of great power, and I recollect a similar feat of courage* displayed by it, which in fact I made the subject of an oil painting. It has a sharp bustling note like the generality of the tribe when taking wing; pursues its finny prey below the surface, and is altogether a brisk lively bird."—*C. W. Smith's MS. Notes*.

The Smyrna King-fisher has been observed by the Curator in Bengal, Behar and Orissa; it is very common at Garden Reach, and indeed in all the neighbourhood of Calcutta.

19. *Halcyon Gurial*. The Gurial King-fisher. Presented by Mr. J. T. Pearson.

20. Another specimen, shot by the Curator, and mounted in the Museum.

Alcedo Gurial. Latham. Gen. Hist. IV. 12.

"This bird is not very common, but is more frequently met with in Bengal than in the other Provinces. It is very strong and powerful, as an instance of which I once observed a contest between one of them and a Hawk of considerable size, in which the Hawk was worsted, and obliged to leave his hold from the effects of a severe blow which the other administered to him on the breast. When wounded, considerable caution is required in handling, for a single blow would disable a person's hand."—*C. W. Smith's MS. Notes*.

As the published descriptions of the Gurial King-fisher are meagre, the following is here inserted. It was drawn up immediately after the death of the only specimen the Curator met with at Midnapore, during a four years' residence there. It is common near Calcutta.

* See Note to No. 20.

Olive brown and green King-fisher with red bill.

Weight $7\frac{1}{3}$ ounces.

Size that of a common pigeon.

Length, from the tip of the bill to the rump $11\frac{1}{2}$ inches, ditto from the tip of the bill to the tip of the tail 16 inches, ditto from ditto to the mid-claw $13\frac{1}{2}$ inches.

Ditto from the base of the bill to the rump $8\frac{1}{2}$ inches, breadth from tip to tip of the wings 22 inches.

Bill long and pointed; flat, like all the Halcyons, at the top, from the tip to the insertion of the fore-head 3 inches long, to the gape $3\frac{1}{2}$ inches; circumference at the base $3\frac{6}{10}$ inches, do. in the centre $1\frac{6}{10}$ inches, colour bright red with black tip. Margin of the eye-lids bare, red under eye-lid, furnished with a row of dingy olive brown feathers near the margin, and below buff coloured; iris dark red. Legs and feet bright scarlet. Head, cheeks, and upper two-thirds of the back of the neck dark olive brown; throat pale straw colour, almost white; breast, neck, and lower third of the back of the neck buff, with the tip of each feather bounded by a narrow margin of the same olive brown colour as the head, forming dotted crescent-like lines; breast, belly, inner wing coverts, thighs, and vent of a bright orange buff, upon a lighter ground; upper part of the neck, scapular, and lesser wing coverts dark brownish green; greater wing coverts, quills, sides of the lower part of the back, upper tail coverts, and tail, dark greenish blue; back from the shoulders to the rump bright azure with silky feathers, shining like satin; false wing of three feathers; quills blue on the outer side, and in the secondary a little blue towards the tips in the inner side, with black shafts, and inner web of the latter edged for two-thirds from the base with dirty white.

The Gorial King-fisher has a laughing screaming note. It is the largest Indian species known to the Curator. In the neighbourhood of Calcutta it is common, and probably in the whole Delta of the Ganges, or Sunderbunds, and Dr. M'Clelland brought specimens from Assam. Its flight consists of short quick jerks, very vigorous, and long continued. In fishing it does not hover; but perches upon the high bamboo bush, or on a middle-sized tree over a pool, waiting for its prey, where its blood-red bill shines brightly in the sun, and its great size, and violent plunge into the water, give one the idea of a noble bird.

21. *Halcyon Amauropterus*. Mihi. Brown winged King-fisher.

This bird appears to be undescribed, and indeed hitherto unknown. It has been named as above by the Curator ; and the following is its description :—

Large fawn coloured King-fisher, with brown wings and tail.—Length from tip of bill to the end of the tail 14 inches, breadth from tip to tip of the wings 16 inches, length of bill $3\frac{1}{4}$ inches. Bill and feet scarlet. Head, neck, belly and neck fawn coloured or buff, each feather tipped with brown. Wings and tail smoke coloured. Back cærulean blue. Iris dark brown.

Found near Calcutta.

22. *Halcyon Collaris*.—Collared King-fisher.

From the Chinese collection.

Alcedo Collaris. Turton's Lin. I. 280. Shaw. Gen. Zool. VIII. 80.

Collared King-fisher. Latham Gen. Hist. IV. 27.

Martin-Pêcheur a collier blanc. Dict. Class. D'Hist. Nat. X. 227.

23. Genus *ALCEDO*.Sp. *A. Rudis*.—Pied King-fisher.

Shot by the Curator, and mounted in the Museum.

Alcedo Rudis. Lin. Syst. Nat. I. 181. Gmelin Lin. I. 454. Turton's Lin. I. 283. Shaw. Gen. Zool. VIII. 63.

Black and white King-fisher. Latham. Gen. Hist. IV. 15.

Martin Pêcheur Pie. Dict. Class. D'Hist. Nat. X. 231.

“ This species is very numerous ; there is not a river, stream or pool without its complement of these birds, where they may be seen constantly on the look-out, hovering like this tribe, and anon plunging beneath the water in pursuit of their prey.”—*C. W. Smith's MS. Notes*.

The Pied King-fisher is not so common in the neighbourhood of Calcutta as in Behar and Orissa. At Midnapore it is very common, and forms a striking feature in the picture of nature, as it hovers in the beauty of its glossy black and white, satin-like plumage, over the streams. From a height of 20 or 30 feet it plunges down dead as a stone into the water, and remains below it so long, that the ripple over the surface clears away sometimes before it comes up again.

The Pied King-fisher is a very beautiful bird ; its plumage being smooth, snowy white, and jet black, in patches of irregular size and

shape, shining like satin, and lying very close. On the top and back of the head the feathers are loose, and somewhat lengthened into a plume.

24. Another specimen from the Chinese collection.

25. *Alcedo Bengalensis*.—Indian King-fisher.

Shot by the Curator, mounted in the Museum.

Alcedo Bengalensis, Gmelin. Syst. Nat. I. 450. Turton Lin. I. 277. Shaw. Gen. Zool. VIII. 102.

Indian King-fisher, Latham. Gen. Hist. IV. 43. Griffith's Cuvier, VII. 409.

Martin Pecheur du Bengale, Dict. Class. D'Hist. Nat. VII. 409.

"This species is pretty common, and much resembles the British King-fisher in its motions, rapidity of flight, and note."—*C. W. Smith's MS. Notes*.

The Bengal King-fisher is very common in the neighbourhood of Calcutta. It is frequently seen seated on a stick standing upright in a paddy field, watching for small fishes in the shallow water, when its red breast shining in the morning sun seems like a living ruby.

26. Genus CEYX.

Sp. *C. Azurea*.—The Azure King-fisher.

From the Chinese collection.

Alcedo Tribrachys. Shaw. Gen. Zool. VIII. 105.

Azure King-fisher. Latham. Gen. Hist. IV. 61.

Ceyx Azurea. Stephens' Shaw's Gen. Zool. XIII. 106.

27. Trib. DENTIROSTRES.

Fam. MUSCICAPIDÆ.

Genus MUSCIPETA.

Sp. *M. Flaviventris*.—Yellow bellied Fly-catcher.

Muscipeta Flaviventris, Griffith's Cuvier, VI. 334.

28. Genus MUSCICAPA.

Sp. *M. Azurea*.—Azure Fly-catcher.

Celestial Fly-catcher. Latham Gen. Hist. VI. 201.

Muscicapa Azurea. Stephens' Shaw's Zool. XIII. 116. Griffith's Cuvier, VI. 341.

29. *Muscicapa Flammea*.—Flameous Fly-catcher.

Shot by the Curator, and mounted in the Museum.

Muscicapa Flammea. Shaw. Gen. Zool. X. 372.

Flammeous Fly-catcher. Latham Gen. Hist. VI. 173.

Muscipeta Flammea. Zool. Proceedings, 1832, p. 85.

“I met with this bird in a grove of trees near Gyah, there were a pair of them, the female merely differing in the plumage being less bright.”—*C. W. Smith's MS. Notes*.

The specimens in the Museum were shot at Garden Reach in the beginning of the year 1836, when a flight of them settled in some lofty larch trees. The morning was foggy, and none were seen during a space of two months afterwards. A specimen was brought to the Curator at Midnapore. He has also seen them at Juanpore, and they are not uncommon at Darjeeling. The female is yellow where the male is red.

29. Another specimen of the Flammeous Fly-catcher. *See Note above*.

30. *Muscicapa Cærulea*.—The Cærulean Fly-catcher.

Shot by the Curator, and mounted in the Museum.

Muscicapa Cærulea. Gmelin. Lin. Syst. Nat. I. 943. Turton's Lin.

I. 579. Stephens' Shaws' Gen. Zool. X. 383 Griffith's Cuvier, VI. 341.

Azure Fly-catcher. Latham Gen. Hist. VI. 180.

Gobe-mouche Azur. Dict. Class. D'Hist. Nat. VII. 401.

The Cærulean Fly-catcher is a native of Bengal. It is common at Garden Reach and its vicinity, where it is to be seen in the lower branches of the mangoe trees, from whence it now and then takes a short flight in pursuit of insects, returning again immediately to the same tree.

31. *Muscicapa* ———. Broad-tailed Fly-catcher.

Shot by the Curator, and mounted in the Museum.

Broad-tailed Fly-catcher. Latham. Gen. Hist. VI. 178.

The broad-tailed Fly-catcher is met with at Garden Reach, near Calcutta. Its habits are much the same as those of the Cærulean Fly-catcher.

31. *Muscicapa Verditer*. Verditer Fly-catcher.

Shot by the Curator, and mounted in the Museum.

Verditer Fly-catcher. Latham. Gen. Hist. VI. 182.

The Verditer Fly-catcher is found in the neighbourhood of Calcutta, but it is not very common. The Curator has not seen it any where else.

32. *Muscicapa* ——. Fly-catcher.

Chinese collection

33. Fam. LANIADÆ.

Genus TYRANNUS.

Sp. *Tyr. Leucogaster*. Tyrant Shrike.

Lanius Tyrannus. Lin. Syst. Nat. I. 136. Gmelin. Lin. I. 302.

Turton's Lin. I. 176. Shaw's Gen. Zool. VII. 304.

34. Genus OCYPTERUS.

Sp. *Ocy. Rufiventer*. Red-bellied Ocypterus.

Presented and mounted by M. Bouchez.

Langrayen a ventre roux. Dict. Class. D'Hist. Nat. IX. 209.

Ocypterus Rufiventer. Griffith's Cuv. VI. 288.

35. *Ocypterus Leucogaster*. White-bellied Ocypterus.

Chinese collection.

Lanius Leucorhynchus. Gmelin's Lin. I. 305. Turton's Lin. I. 178.
Shaw's Gen. Zool. VII. 323.

Artamus Leucorhynchus. Steph. Shaw. Gen. Zool. xii. 137.

Artamus Leucogaster. Griffith's Cuv. VI. 287.

Langrayen a ventre blanc. Dict. Class. D'Hist. Nat. IX. 290.

36. Genus DICRURUS.

Sp. *D*———. Shrike.37. *Dicrurus Indicus*.—Long-tailed Shrike.

Shot by the Curator, and mounted in the Museum.

Drongo Drongolon. Dict. Class. D'Hist. V. 621.

"This species is common throughout India; it is to be seen in every field, is restless, and constantly in motion; and frequently to be seen on the backs of cattle extracting the vermin. It feeds upon insects, is a ferocious and most pugnacious bird, will occasionally kill small birds, with the utmost nonchalance will attack the crow and

kite, which it drives before it as if defeat was a stranger to it. We have therefore no difficulty in the derivation of its vulgar name of the King-crow".—*C. W. Smith's MS. Notes.*

The *Dicrurus Indicus* is one of the most common birds in Bengal. It is to be seen at all seasons mounted on walls, hedges, and the tops of palings, and elevated things of the kind, watching for insects, which it darts upon by a short quick flight, and returns again to its place. In form the King-crow, as it is termed, is very elegant. It is compact and well proportioned, and greatly ornamented by the rich glossy black of its plumage, and the graceful outward curve of either side of its long forked tail. In manner it is lively and bold, but not familiar. And altogether, the King-crow is one of the most striking, and most pleasing objects of Indian animated nature.

38 ———. Chinese collection.

39. Genus LANIUS.

Sp. *L. Italicus*.—Italian Shrike.

40. *Lanius Rufescens*.

41. *Lanius Curcutti*. Corcutti Shrike.

Shot by the Curator, and mounted in the Museum.

42. *Lanius* ———.

Chinese collection.

43. *Lanius* ———.

Chinese collection.

44. Fam. MERULIDÆ.

Genus PITTA.

Sp. *P. Bengalensis*.—Bengal Pitta.

Presented by Lieut. Vickery, and mounted in the Museum.

45. *Pitta Erythrogastra*.—Red-bellied Pitta.

Chinese collection.

Pitta Erythrogastra.—Stephens' Shaw's Gen. Zool. XIII. 185.

46. *Pitta* ———. Chesnut-crowned Pitta.

Presented by Dr. McCosh, and mounted in the Museum.

This specimen was procured by Dr. McCosh in Assam. It apparently differs from any hitherto described species.

47. Genus *Ixos*.Sp. *I. Jocosus*.

Pink-eared Bulbul.—Jocose Shrike.

Lanius Jocosus. Lin. Syst. Nat. I. 138. Gmelin. Lin. I. 310. Turton's Lin. I. 181.

Jocose Shrike. Lath. Gen. Hist. II. 41.

Lanius Emeria. Shaw Gen. Zool. VII. 332.

Brachypus (?) *Jocosus*. Steph. Shaw, XII. 191.

“These birds are in great request among the natives, being of a fearless disposition, and easily reclaimed. They are taught to sit on the fist, and numbers may thus be seen in any Indian bazar. They have a pretty smart appearance, and the head has an uncommon and handsome plume; but the song, though the few notes of which it is composed are sweet, has neither much strength nor any variety.”—*C. W. Smith's MS. Notes*.

The ear of this bird is clothed with pink feathers, from which character the Curator has ventured to add the English name given above, as, at least, quite as expressive as those it has before. The species is found in great numbers near Calcutta, congregating together on the tops of high bushes, and in middle sized trees. It is also to be met with in Behar and Orissa, and Col. Sykes found it in the Deccan only in the lofty woods of the Ghauts. It is called Bulbul by the natives of India. A good account of its habits is given in Latham's General History of Birds, vol. ii, page 41.

The plumage of the pink-eared Bulbul is glossy in the black and white parts, and the long narrow feathers of the plume are very soft and beautiful, though not silky.

48. *Ixos* ——. Common Bulbul.

Shot by the Curator, and mounted in the Museum.

This is the largest of the two Bengal Bultuls, and is the variety of Latham's Jocose Shrikes. It is found in great numbers congregating together upon trees and bushes throughout all the parts of the provinces of Bengal, Behar, and Orissa; and I believe in all parts of India. It is a noisy chattering bird, with a whistle like one of the lower notes of the English Blackbird.

“In a state of nature the song of this bird is rather contemptible, but when reclaimed and placed near to better songsters, it greatly improves. This species is very common, and there are several varieties, one of which has a small patch of scarlet on the lesser coverts. It is, however, the Cashmere Bulbul, which is so highly prized, and is generally esteemed the most melodious songster in India.”—*C. W. Smith's MS. Notes.*

49. *Ixos* ——.

Chinese collection.

50. GENUS *ORIOIUS*.

Sp. *Oriolus Chinensis*.—Chinese Oriole.

Chinese collection.

Oriolus Chinensis. Lin. Syst. Nat. I. 160. Gmelin I. 383.

Cochin China Oriole. Lath. Gen Hist. III. 139.

Chinese Oriole. Shaw. Gen. Zool. VII. 412.

Oriolus Sinensis, Synop. Griffith's Cuv. VI. 397.

51. *Oriolus Melanocephalus*.—Black-headed Oriole.

Shot by the Curator, and mounted in the Museum.

Oriolus Melanocephalus. Lin. Syst. Nat. I. 160. Gmelin I. 383.

Black-headed Oriole. Lath. Gen. Hist. III. 140. Shaw's Gen. Zool. VII. 411.

“This bird is dispersed throughout India, it frequents groves, and is constantly flying from tree to tree. In the spring its plaintive note resembles one lengthened full toned note on the flute; ushers in the dawn; and resounds from every side. It feeds upon the berries of the Bhur and Pepul trees and on insects.”—*C. W. Smith's MS. Notes.*

The black-headed Oriole is a very common bird in all parts of Bengal, and Mr. Smith mentions it above as dispersed throughout India; but Col. Sykes saw it only in the neighbourhood of the Ghauts in the Deccan, where its place seems to be filled by the *Oriolus Galbulus*, the golden Oriole of Latham, which is said to be very abundant there. Its monotonous, low-toned, constantly repeated note is a positive pest, excelled only by that of the Koel, (*Eudynamys Orientalis*,) or Indian Cuckow.

52.

53. Genus *Turdus*.Sp. *T. Migratorius*.—American Robin.

Presented by Dr. Lea.

Turdus Migratorius. Lin. Syst. Nat. I. 292. Gmelin I. 811. Turton's Lin. I. 492. Shaw's Gen. Zool. X. 276.

Red-breasted Thrush. Lath. Gen. Hist. V. 144.

American Robin. Griff. Synop. Cuv. VI. 383.

The Robin. Wilson's American Ornithol. Edit. 1831, Edin. II 112.

54. *Turdus Saularis*.—Little Indian Pie.

Presented and mounted by M. Bouchez.

Gracula Saularis. Lin. Syst. Nat. I. 165. Gmelin Lin. I. 397. Turton's Lin. I. 240. Shaw's Gen. Zool. VII. 474.

Dial Grakle. Lath. Gen. Hist. III. 165.

Turdus Saularis. Sykes' Catalogue, Zool. Proc. pt. 2. 1832. p. 87.

"This familiar and sociable bird often reminds me of its more beautiful brother the British Red-breast; like to that pretty and amiable visitor, it is seen much about the habitation of man, and has all its smart and quick motions. Its song is also similar, and when domesticated it may be taught to speak."—*C. W. Smith's MS. Notes*.

The Dial is a lively, active little bird, rather like a little magpie, having a bright glossy-like black plumage, with snow-white band on the wings, and under parts of the same. It hops about like a Robin, pertly cocking its tail, and whistling a somewhat similar melody. It is very common in Bengal, in the neighbourhood of Calcutta; but less so in the Mofussil, though I have frequently seen it in the provinces of Behar, Orissa, and Allahabad. The plumage of the female is similarly marked to that of the male; but not so glossy.

55. *Turdus* —.

American collection.

56. *Turdus Surpowee*.—Milh. Surpowee Thrush.

Shot by the Curator, and mounted in the Museum.

I have found this bird only in the neighbourhood of Calcutta, where it is not uncommon. It is generally met with near jheels, hopping about the lower branches of overhanging bushes, or upon the ground.

at the brink of the water. I have named it, as M. Bouchez told me it is called by the natives; and I should have described it had I not been obliged to leave Calcutta; and I have now no specimen to refer to.

57. Genus *SIBIA*, Hodgson.

Sp. *S. Nigriceps* HODGSON.—Black-headed Sibia.

Presented by Mr. Hodgson from Nepaul; and another by Mr. Bruce, who received it from Almorah, whence it was sent to him by Lieut. H. Huddleston, 7th Regt. N. I. It is very common at Darjeeling. Mounted in the Museum.

58. *Sibia Picaoides*.—Hodgson's Picaoid Sibia.

Presented by Mr. Hodgson, from Nepaul. Mounted in the Museum.

59. *Sibia* — ?

Presented by Mr. Bruce, who received it from Lieut. Huddleston at Almorah. Mounted in the Museum.

60. — — — — —

Presented by Mr. Bruce. Also from Almorah. Mounted in the Museum.

61. *Turdus* —.

62. Fam. SYLVIADÆ, Vigers.

Genus SYLVIA, Auct.

Sp. *S. Rubetra*.—Whin Chat.

Chinese collection.

63. *Sylvia* — ?

Chinese collection.

This specimen appears to be allied to, if not a variety of 62.

64. *Sylvia* — ?

Shot by the Curator, and mounted in the Museum. Probably a variety of the above.

65. *Sylvia* — ?

Shot by the Curator at Garden Reach, and mounted in the Museum.

This bird is called Chick-chickee by the natives.

66. *Sylvia* ——?

Chinese collection.

67. *Sylvia* ——?

Presented by Captain Pemberton.

68. *Sylvia* ——?

Chinese collection.

69 *Sylvia* ——?—The Saumer.

70.

71. Genus *MALURUS*, Vieillot.

Sp. *M. Longicaudus*.

Motacilla Longicauda. Gm. Lin. I. 954. Turton Lin. I. 586.

Sylvia Longicauda. Shaw Gen. Zool. X. 756.

Long-tailed Warbler. Lath. Gen. Hist. VII. 119. Griffith's Cuv. VII. 467.

Shot by the Curator, and mounted in the Museum.

Common in the neighbourhood of Calcutta, and where, according to Latham, it is called Toon-toonee. He says, "the nest found among mangoe trees, most commonly in shape of a purse, generally composed of two living leaves attached together by fibres, somewhat in the manner expressed in the *Indian Zoology* as belonging to the Tailor Warbler, though not with so wonderful a construction; the hollow space between the two leaves is lined with cotton by way of nest, and the eggs are three in number, whitish, marked with flesh-coloured spots, in length three-fifths of an inch."

72.

73.

74. Genus *JORA*, Horsfield.

Sp. *J. Scapularis*. Horsf.

Jora Scapularis. Horsf. Lin. Trans. XIII. 152. Stephens' Shaw Zool. XIII. 217.

Shot by the Curator, and mounted in the Museum.

The *Jora Scapularis* is very common in the neighbourhood of Calcutta. It is also to be met with in Orissa.

75.

76. Genus MALURUS.

Sp. ———

Chinese collection.

77. *Malurus Cyaneus*.—Superb Warbler.

Presented by Captain Pemberton.

Motacilla Cyanea. Gm. Lin. I. 991. Turton's Lin. I. 611.*Sylvia Cyanea*. Shaw Zool. X. 754.

Superb Warbler. Lath. Gen. Hist. III. 117. Griffith's Cuv. VI. 468.

Malurus Cyaneus.—Stephens' Shaw's Zool. XIII. 223.

Inhabits the southern parts of New Holland.

78. *Malurus Cyaneus*. Superb Warbler.

Another specimen from the Chinese collection.

79. Genus ANTHUS, Beckstein.

Sp. *A. Agilis*. Sykes, Proc. Zool. Soc. 1832. p. 91.

Shot by the Curator at Garden Reach, and mounted in the Museum.

80. *Anthus Trivialis*.—Pipit Lark.

Shot by the Curator at Garden Reach, and mounted in the Museum.

Alauda Trivialis. Lin. Syst. Nat. I. 288. Gm. Lin. I. 796. Turton's Lin. I. 483. Stephens' Shaw's Zool. XIII. 238.*Alauda Sepiaria*. Shaw's Zool. X. 542.

Pipit Lark. Latham. Gen. Hist. VI. 278.

Field Lark. Griffith's Cuv. VI. 477.

The present specimen was shot in the cold weather. I have not seen it but at that season; and so far it agrees with Latham's remark of its habits in England, that it is rarely seen, except in the winter-months.

81. Fam. PIPRIDÆ.

Genus PARUS. Lin.

SP. *P. Cristatus*.—Crested Titmouse.

Parus Cristatus. Lin. Syst. Nat. I. 340. Gm. Lin. I. 1005. Turton's Lin. I. 622. Shaw's Zool. X. 64 and XIII. 246.

Crested Titmouse. Lath. Gen. Hist. VII. 249. Griffith's Cuv. VII. 121.

82. Genus *PARDALOTUS*, Vieillot.Sp. *P. Australis*.—New Holland Manakin.

New Holland Manakin. Lath. Gen. Hist. VII. 238.

Pardalotus Australis. Stephens' Shaw's Zool. XIII. 252.

83. Fam. FRINGILLIDÆ.

Genus *RAMPHOCELIS*, Desmarest.Sp. *R. Jacapa*.

Chinese collection.

Tanagra Jacapa. Lin. Sys. Nat. I. 313. Gm. Lin. I. 888.

Red-breasted Tanager. Lath. Gen. Hist. VI. 2. Griffith's Cuv. VI. 317.

Ramphopsis Jacapa. Shaw's Zool. X. 439.84. Genus *ALAUDA*, Auctorum.Sp. *A*——— Finch Lark.

Shot by the Curator, and mounted in the Museum.

Finch Lark. Lath. Gen. Hist. VI. 307.

I shot the present specimen at Garden Reach, during the cold weather, but Latham states it to be found at Cawnpore in the month of April. I do not find it in any other author. Neither Franklin, Sykes, nor Tickell have mentioned it.

85. —————

Chinese collection.

86. —————

Chinese collection.

87. Genus *FRINGILLA*, Auctorum.Sp. *F. Cælebs*.—The Chaffinch.

Chinese collection.

Fringilla Cælebs. Lin. Syst. Nat. I. 318. Gm. Lin. I. 901.

Turton's Lin. I. 552. Steph. Shaw's Zool. IX. 442. and XIV. 37.

Chaffinch. Lath. Gen. Hist. VI. 57.*The Chaffinch*. Griffith's Cuv. VII. 138.*Gros-bee Pinson*. Dict. Class. D'Histoire Nat. VII. 537.

This specimen may possibly be a native of China, and if so, it has a new locality. Latham says, it is met with on the Coast of Africa, at the Cape of Good Hope, and at Aleppo. I have not seen nor heard of it in India.

88. 89.—Fam. LOXIADÆ.

Genus LOXIA. Ray.

Sp. *Loxia Punctularia*.—Cowry Grosbeak.

Shot by the Curator, and mounted in the Museum.

Loxia Punctularia. Lin. Syst. Nat. I. 302. Gm. Lin. I. 851. Turt. Lin. I. 520. Steph. Shaw's Zool. IX. 330. Griffith's Cuv. VII. 152.

Cowry Grosbeak. Lath. Gen. Hist. V. 247.

Gros-bec Domino. Dict. Class. D'Hist. Nat. VII. 526.

Coccothraustes Punctularia. Stephens' Shaw's Zool. XIV. 87.

The Cowry Grosbeak flies in large flocks, and is to be met with in most parts of Bengal. Like the Amaduvade Finch, there are many varieties.

90. *Loxia Malacca*.—Malacca Grosbeak.

Presented and mounted by M. Bouchez.

Loxia Malacca. Lin. I. 302. Gm. Lin. I. 851. Steph. Shaw's Zool. IX. 332.

Malacca Grosbeak. Lath. Gen. Hist. V. 244. Griffith's Cuv. VII. 152.

Gros-bec Jacobin. Dict. Class. D'Hist. Nat. VII. 530.

90. b. *Loxia Coccothraustes*.—Haw Grosbeak.

Loxia Coccothraustes. Lin. I. 299. Gm. Lin. I. 844. Steph. Shaw's Zool. IX. 236.

Coccothraustes Vulgaris. Steph. Shaw's Zool. XIV. 86.

Haw Grosbeak. Lath. Gen. Hist. V. 211.

Common Grosbeak. Griffith's Cuv. VII. 156.

Gros-bec Commun. Dict. Class. D'Hist. Nat. VII. 524.

91. *Loxia Leucocephala*.—White-headed Grosbeak.

Chinese collection.

Fringilla Leucocephala. Steph. Shaw's Zool. IX. 493.

Spotted-sided Grosbeak. Lath. Gen. Hist. I. 248.

Gros-bec a tete blanche et dos rouge. Dict. Class. D'Hist. Nat. VII. 542.

92. *Loxia Astrilda*. Wax-bill Grosbeak.

Loxia Astrilda. Lin. I. 303. Gm. Lin. I. 852. Turton's Lin. I. 520.

Wax-billed Grosbeak. Lath. V. 257.

Coccothraustes Astrilda. Shaw's Gm. Zool. XIV. 87.

Gros-bee Astrild. Dict. Class. D'Hist. Nat. VII. 520.

93. Fam. STURNIDÆ.

Genus ACRIDOTHERES, (?) Vieillot.

Sp. *A. Varius*?—Pied Grakle.

Chinese collection.

Pied Grakle. Lath. Gen. Hist. III. 169. Shaw's Zool. VII. 464.

94. Genus STURNUS. Lin.

Sp. *S. Vulgaris*.—Common Starling.

Chinese collection.

Sturnus Vulgaris. Lin. I. 290. Gm. Lin. I. 801. Turton's Lin.

I. 487. Steph. Shaw's Zool. X. 483. XIV. 52.

Common Stare. Lath. Gen. Hist. V. 1. Griffith's Cuv. VII. 172.

I have never seen the common Starling in Bengal; but in the cold season 1837-38, a specimen was brought me at Juanpore; in no wise differing, as I thought, from the English bird.

95. *Acridotheres Tristis*.—Common Mynha.

Shot by the Curator, and mounted in the Museum.

Paradisea Tristis. Lin. I. 167. Gm. Lin. I. 401. Turt. Lin. I. 242.

Paradise Grakle. Lath. Gen. Hist. VII. 147. Shaw's Zool. VII. 455.

Acridotheres Tristis. Steph. Shaw. XIV. 57.

"This species is exceedingly numerous, and is generally diffused throughout India, even the sparrow is not more frequent; in its manners it is as noisy, and nearly as familiar; like that bird it not unusually makes its nest in the house thatch, or between the rafters. It is very prolific, and has several broods during the year. A pair made their nest in the beams of my verandah, during the rainy season of 1822, and to my surprise had two successive broods within a very short period of each other; but the vermin was so numerous that I was obliged to have the nest destroyed, and the crevice filled up. It is a brisk lively bird, apt to learn words and to whistle, and withal becomes very attached to its master; so much so, that instances are

known in which it has been allowed to range abroad during the day, with a confidence of its return at night."—*C. W. Smith's MS. Notes.*

The *Acridotheres Tristis* is, as every body knows, one of the merriest birds in India, which has caused some to wonder at the trivial name given by Linnæus. That great naturalist, however, placed it among the Paradise birds, and contrasting its sombre clothing with the brilliant plumage of the rest of that genus, he gave it the name of *Tristis*, not from its disposition, but its raiment. It is the Pastor *Tristis* of Temminck, Franklin, and Sykes. Its locality as given by the older writers, is India and the Philippine Islands. Colonel Franklin found it on the banks of the Ganges, and Colonel Sykes in the Deccan. I myself have seen it wherever I have been, except Darjeeling; it most abounds in Bengal. Beyond doubt it is, as Mr. Smith observes, the commonest bird in India. It was imported into the Island of Bourbon to destroy the grasshoppers, and was found so useful as to be especially protected by the laws. Latham says, it builds twice a year, and at each time lays four blue eggs. The natives of India are almost as fond of it, and tame and pet it as much as they do the Parroquet. They procure the young birds by placing an earthen pot in the fork of a tree, the mouth being put at the side to defend it from the weather, for it to breed in, and take the little ones when rather more than half-fledged. The young bird is taught to speak and whistle, and soon becomes very fond of his master.

96. *Acridotheres Malabaricus*.—Malabar Mynha.

Shot by the Curator at Garden Reach, and mounted in the Museum.

Turdus Malabaricus. Gm. Lin. I. 815. Turt. Lin. I. 496..

Malabar Grakle. Lath. Gen. Hist. III. 151. Shaw's Gen. Zool. VII. 471.

Turdus Malabaricus. Steph. Shaw's Zool. X. 305.

Acridotheres Malabaricus. Steph. Shaw's Zool. XIV. 57.

Latham, on the authority of Dr. Buchanan, thinks this a different species from his Pagoda Grakle, (*Acridotheres Pagodurum*); but I suspect there is some mistake about the matter, the differences between the three birds being such as difference in sex or age would readily account for. Both species (if they are distinct) are found in small

flocks in Bengal, Behar, and Orissa, and are plentiful at Juanpore, near Benares.

97. *Acridotheres* — ?

Shot by the Curator, and mounted in the Museum.

This is the Saat Bhye, or Seven Brothers of the natives, so called from being always found in a company of about that number. As every body knows, it is one of the most chattering, noisiest birds in India, squeaking and hopping about, now on the ground, then upon a tree, the flock being constantly on the move; when one starts, all the rest follow it, one after another, making generally but a short flight of not more than 40 or 50 yards at a time; and when alighted they hold a sort of consultation, hopping and squeaking about all the time, till after a few minutes they move off to another tree, and so on for the greater part of the day, rarely staying for more than half an hour in the same place: they feed on insects. It is common wherever I have been in the plains of India.

98. *Acridotheres Calvus*.—Bald Mynha.

Chinese Collection.

Gracula Calva. Lin. I. 164. Gm. Lin. I. 396. Turt. Lin. I. 240.

Bald Grakle. Shaw's Zool. VII. 461. Lath. Gen. Hist. III. 146.

Acridotheres Calvus. Steph. Shaw's Zool. XIV. 57.

99. Gen. *CRACTICUS*, Vieillot.

C. Chalybeus.—The Green Paradise Bird.

Chinese collection.

Paradisea Viridis. Gm. Lin. I. 402. Turt. Lin. I. 244.

Chalybean Paradise Bird. Shaw's Zool. VII. 504.

Blue-green Paradise Bird. Lath. Gen. Hist. III. 195.

Barita Viridis. Tem. Man. II.

Cracticus Chalybeus.

100. Genus *PICA*, Brisson.

Fam. *CORVIDÆ*.

Sp. *Pica Vagubunda*.—Rufous Magpie.

Shot by the Curator, and mounted in the Museum.

"Its namesake in Europe is proverbial for its noise and restlessness. The present subject possesses a full portion of the above

qualities, added to which a familiarity not quite so innocuous. I have known it enter a covered verandah of a house, and nip off half a dozen young Geraniums; visit a cage of small birds, begin by stealing the grain, and end by killing and eating the birds, and repeating these visits daily till destroyed. Its flight has the same jerk, and its motions the same bustling character as the English Magpie. The egg is a plain greyish white."—*C. W. Smith's MS. Notes.*

101. *Pica Sinensis*.—Chinese Magpie.

Chinese collection.

Coracias Sinensis. Gm. Lin. I. 381. Turt. Lin. I. 229.

Chinese Roller. Lath. Gen. Hist. III. 54.

Specious Jay. Shaw's Gen. Zool. VII. 364.

Pi (?) Sinensis. Steph. Shaw's Zool. XIV. 65.

102. Genus GARRULUS, Brisson.

Sp. *Garrulus Gularis*.—Gular Jay.

103. *Garrulus Cristatus*.—Crested Jay.—Blue Jay.

Corvus Cristatus. Lin. Syst. Nat. I. 157. Gm. Lin. I. 369. Turt. Lin. I. 221.

Blue Jay. Lath. Gen. Hist. III. 55. Shaw's Gen. Zool. VII. 359.

Garrulus Cristatus. Steph. Shaw's Zool. XIV. 66.

104. Genus CORACIAS, Lin.

Sp. *C. Bengalensis*.—Bengal Jay.—Blue Bird.

Shot by the Curator, and mounted in the Museum.

Coracias Bengalensis. Lin. I. 159. Gm. Lin. I. 380. Turt. Lin.

I. 320. Stephens' Shaw's Zool. XIV. 71.

Bengal Roller. Lath. Gen. Hist. III. 72.

Indian Roller. Shaw's Gen. Zool. VII. 390.

"Though gifted with so brilliant a plumage, much cannot be said in praise of its shape. Its appearance on the wing is lovely, yet when perched we observe a large head, thick neck, prominent breast, and a pinched body, which is rendered more conspicuous by a long tail. It is a very common bird, is little afraid of man's approach, and is pugnacious, driving away the crow without much effort; it is a very noisy, screaming bird, and in this respect is frequently very troublesome. With the Hindoos it is esteemed sacred; they consider

it propitious if seen upon the day which concludes the Dussorah, or Doorga Pooja festivals, and discharge their matchlocks to put it on the wing. The Birmahs annually send parties to procure the feathers of this bird, and of the painted Kingfisher.”—*C. W. Smith’s MS. Notes.*

105. GENUS *CORVUS*, Auctorum.

Sp. *C. Dauricus*.—White-breasted Crow.

Corvus Dauricus. Gm. Lin. I. 367. Turt. Lin. I. 219. Stephens’ Shaw’s Zool. XIV. 69.

White-breasted Crow., Lath. Gen. Hist. III. 17. Shaw’s Gen. Zool. VII. 349.

“The Indian Crow is more social and familiar than any of its tribe in Britain; like the sparrow it is every where, on the house top, in the verandah, even venturing to take a snatch at the breakfast table, yet always awake to danger, it is off at a moment’s warning.”—*C. W. Smith’s MS. Notes.*

This bird is very common wherever I have been on the plains of India; but Calcutta seems to be its head-quarters, where it is to be seen at all times of the year, upon the houses, in the fields, and on the shipping in the river. It awakes before day-light on the gun being fired in Fort William, and by its incessant cawing, seems determined that every body else shall awake likewise. Latham’s drawing is bad; and the description scarcely agrees with our bird. If this be the “common crow of India” of Col. Sykes’ catalogue, it is in his opinion the *Corvus Splendens* of Vieillot: but with which it also does not agree.

106.

GENUS *PTILONORYNCHUS*, Kuhl.

Sp. *P. Violaceus*.

Presented by Captain Pemberton.

107.

Fam. *BUCERIDÆ*.

GENUS *BUCEROS*, Auctorum.

Sp. *Platyrynchus*.

Flat-crowned Hornbill.

Chinese collection.

108.

Buceros Panayensis.—Panayan Hornbill.

Chinese collection.

Buceros Panayensis Gm. Lin. I. 360. Turt. Lin. I. 214. Steph. Shaw's Zool. XIV. 82.

Furrowed Horn-bill. Shaw's Gen. Zool. VIII. 33.

Panayan Horn-bill. Lath. Gen. Hist. II. 321.

109. *Buceros Homrai*.

Presented by Dr. McCosh.

Mr. Hodgson discovered this magnificent species in Nepaul. Lieutenant Phayre, 7th Regiment Native Infantry, brought me a specimen from Moulmein; and this in the Society's Museum was brought from Assam, by Dr. McCosh. A species of Horn-bill more magnificent than the above is found near Kerseangurry, on the road to Darjeeling, at an elevation of about 3000 feet; the head and neck furnished with long disintegrated feathers, forming a sort of mane, their colour light chesnut, and that of the belly dark chesnut, back and wings glossy black, tail do. with white tip. Bill without a casque. I forbear to say more on this bird, having sent it to Mr. Hodgson of Nepaul for description—a gentleman whose exertions in this branch of Natural History in the Himalayah Mountains, entitle him to a consideration of the kind.

Fam. PSITTACIDÆ.

Genus PSITTACUS, Auctorum.

Sp. *Ps. Erythacus*.—Ash-colored Parrot.

Psittacus Erithacus. Lin. I. 144. Gm. Lin. I. 332.

Psittacus Erythacus. Turt. Lin. I. 197. Steph. Shaw's Zool. XIV. 107.

Ash-colored Parrot. Lath. Gen. Hist. I. 208. Shaw's Zool. VII. 486.

111. *Psittacus Sinensis*.—Green and red Chinese Parrot.

Chinese collection.

Psittacus Sinensis. Gm. Lin. I. 337. Turt. Lin. I. 200. Steph. Shaw's Zool. XIV. 107.

Green and red-sided Chinese Parrot. Lath. Gen. Hist. II. 232.

Red-sided Parrot. Shaw's Zool. VIII. 490.

112. *Psittacus Pendulus*. Mihi.—Pendulous Parrot.

Chinese collection.

As I cannot find that this bird has been described by any author, I have ventured to offer a name for it. The following description and remarks are from Mr. Smith's notes:—

“The length of these little birds, the smallest of the tribe in India, is about five inches. The bill is an orange red, the crown of the head, back of the neck and wings a blueish green; the throat, breast, and belly a light yellowish green; a spot of ultramarine colour on the throat; the lower part of the back and the tail coverts deep scarlet; the tail deep green and pointed; and the legs a light orange.

The present drawing was made from a pair of these birds in the possession of a native at Gyah. They inhabit Bengal, however, and do not appear to be found in the Gyah division, nor so far to the Westward. I have seen cages full of them in Calcutta. They have no note that I ever heard, nor do they speak; they are very tame, and when going to roost, resort to the upper part of the cage, where they hang in the manner that I have placed the upper bird.”—*C. W. Smith's MS. Notes.*

In Mr. Smith's drawing the “upper bird” referred to, is represented as hanging to a bough by its legs, with the wings folded almost close to the side, the tail a little spread, and the head downwards.

113. Genus *NANODES*. Vigors.Sp. *Nan. Pulchellus*.—Turcosine Parrot.

Chinese collection.

114. *Nanodes Discolor*.—Red-shouldered Parrakeet.

Chinese collection.

Red-shouldered Parrakeet. Shaw's Zool. 466.115. Genus *PLATYCERCUS*, Vigors.Sp. *P. Pennantii*.—Pennantian Parrakeet.

Chinese collection.

P. Pennantii. Steph. Shaw's Zool. XIV. 120.*Pennantian Parrakeet.* Shaw's Zool. VIII. 410.116. *Platycercus* —.

Chinese collection.

117. Genus PEZOPORUS, Illiger.

Pez. Formosus.—Ground Parrakeet.

Chinese collection.

Ground Parrakeet. Shaw's Zool. VIII. 454.

118. Genus PALÆORNIS, Vigors.

Pal. Alexandri.—Alexandrine Parrakeet.

Alexandrine Parrakeet. Shaw's Zool. VIII. 423.

Paleornis Alexandri. Zool. Journ. II. 49. Steph. Shaw's Zool. VIII. 123.

119. *Pal. Barrabandi*.

Chinese collection.

120. Genus TRICHOGLOSUS, Vigors.

Sp. *Tr. Hæmatopus*.—Blue-bellied Parrakeet.

Chinese collection.

Blue-bellied Parrakeet. Shaw's Zool. VIII. 413.

121. *Trichoglossus Concinnus*.

Chinese collection.

122, 123, 124. *Trichoglossus Pusillus*.—Small Parrakeet.

Chinese collection.

Small Parrakeet. Shaw's Zool. VIII. 471.

125. Fam. PICIDÆ.

Genus BUCCO, Lin.

Sp. *B. Cyanops*.—Blue-cheeked Barbet.

Shot by the Curator, and mounted in the Museum.

Blue-cheeked Curucui. Shaw's Zool. VII. 7.

The blue-cheeked Barbet is common in Bengal, less so in Orissa, and I have not seen a specimen at Juanpore. Mr. Smith well observes of it, that "It has a singular habit when perched of bowing the head, accompanying each motion with a single note resembling the word 'hoo.' It has two broods, the one in the month of May, the other in November."—*MS. Notes*.

126, 127, 128. *Bucco Indicus*.—Indian Barbet.

The first specimen presented by M. Bouchez. The others shot by the Curator, and mounted in the Museum.

The Indian Barbet is one of the most common birds of India, often congregating in small flocks. One of them is generally perched on the top of the highest tree and nods his head, and cries "buck, buck, buck," every time with the most indefatigable perseverance for hours together. From this cry the generic name was probably taken. It feeds upon seeds, is a social good tempered little fellow, and flies like a lump of a bird, as it is, in short jerks high in the air, though to no great distance at once.

129. Genus *PICUS*, Lin.

Sp. Picus Viridis.—Green Woodpecker.

Green Woodpecker. Lath. Gen. Hist. III. 345. Steph. Shaw's Zool. IX. 183.

130. *Picus Macei*. Cuv.

Common in most parts of India.

131. *Picus* —.

132. *Picus Erythrocephalus*.

133. *Picus Torquatus*.

Chinese collection.

Lewis's Wood-pecker. Lath. Gen. Hist. III. 376.

Picus Torquatus. Wilson Amer. Orn. I. Steph. Shaw's Zool. XIV. 164.

Is this a young bird of the *P. Torquatus*?

134. *Picus* —.

Chinese collection.

136. *Picus Tiga*.—Tiga Woodpecker.

Picus Tiga. Horsf. Trans. Lin. Soc. XIII. 177.

Tiga Wood-pecker. Lath. Gen. Hist. III. 416.

136. Genus *COLAPTES*, Swainson.

Col. (?) *Rufus*.

Presented by Mr. C. W. Smith, and mounted in the Museum. The specimen was purchased among others in a collection from Java.

137. *Colaptes* —.

Presented by Mr. C. W. Smith, and mounted in the Museum; also in the Java collection.

I cannot find this species in any work, is it new?

138. Fam. CUCULIDÆ.

Genus CUCULUS, Auctorum.

Sp. *C. Edolius*.—Edolio Cuckoo.

Chinese collection.

I shot a specimen on the banks of the Ganges below Rajmahal ; and saw several others. I have never seen it in Bengal or Orissa. It is figured and described in Mr. Smith's notes, but he does not state its locality.

Edolio Cuckoo. Stephens' Shaw's Zool. IX. 114.

Cuculus Edolius. Griff. Cuv. VII. 455.

139. *Cuculus Coromandus*.—Collared Cuckoo.

In the original collection.

Collared Cuckoo. Lath. III. 292.

Cuculus Coromandus. Stephens' Shaw's Zool. XIV. 208. Griffith's Cuv. V. 455.

140. *Cuculus* ———.

Presented by Mr. C. W. Smith, from the Java collection.

141, 142. *Cuculus* ———. Metallic Cuckoo.

Chinese collection.

This appears to be Latham's Metalline Cuckoo, described in the General History, III. 301.

143. Genus EUDYNAMYS.

Sp. *Eu. Orientalis*.—The Coel.

Shot by the Curator, and mounted in the Museum.

The Coel is common in every part of India. It is to be found in every thick tree, and in the hot weather, is a pest of no ordinary nature; uttering incessantly the cry from whence its name is taken, "coel," "coel," or "cokeel, cokeel," with a liquid intonation of the *l*. It continues this cry, loud enough to be heard several hundred yards, from morning to night; and indeed from night to morning almost, for I have heard it at 10 o'clock at night, and at 2 in the morning. Latham describes this cry as cheerful and pleasant, but had he heard it he would have thought differently; it is melancholy and monotonous, and wearisome to the listener beyond measure. During the day other noises go to drown it, but at night, and especially early in

the morning, it is an absolute evil, by awaking one, when just dropped a sleep from the exhaustion of the hot preceding day, and the still more terrible early part of the night.

144. Genus *CENTROPUS*, Illiger.

Sp. *Ce. Castanopterus*.

Chesnut Coucal. Original collection.

Chesnut Coucal. Lath. Gen. Hist. III. 243.

"This bird is very common throughout India. It is vulgarly called the Crow Pheasant; and has acquired this appellation from a considerable resemblance to the Pheasant in its mode of running, of crouching, and secreting itself in bushes; and from its taking wing in the same bustling way. It feeds upon insects, grubs, and when opportunity occurs upon carrion. This and the two succeeding specimens are usually seen upon the ground, in which they differ from the other numerous members of their tribe, which seldom alight, but make short flights from one tree to another.

Latham gives the appellation of Coucal to this tribe, to distinguish them from the Cuckoos; but referring to their habits, I have called them "Ground Cuckoo," so strongly opposed to the Cuckoos, which never descend from the tree."—*C. W. Smith's MS. Notes*.

145. *Centropus* —.

Original collection.

Besides these specimens of *Centropus*, Mr. Smith has drawn a third, and I have seen a fourth differing from all, but having lost my notes, I am unable to describe it. The name proposed by Mr. Smith of "Ground Cuckoo," is a very appropriate one, and reminds us of the analogy between the Cuckoos and Parrots in this respect, the Genus *Pezoporus* of the latter being analogous to the Genus *Centropus* of the former.

Mr. Smith describes his second species thus: "This bird is nineteen inches in length, and twenty-four in breadth. The bill is a reddish grey, pale at the edges, strong, rather hooked, and in length two inches. The eye is of a pearly hue, defended above by strong lashes, and having a grey skin or orbit edging the lower half. The plumage of the head, breast, neck, and body is a hoary brown, inclining to black on the crown of the head and behind the neck, and marked

throughout with darker bars. The wing coverts are a red brick colour; the scapulars, secondaries, and quills, barred with black. The tail is fan-shaped, black, with small grey bars sloping to a point on the shaft. The legs are black, and the long claw on the inner hind toe rather less elongated than in the preceding specimen."—*Centropus Castanopterus*.

"This species is found in the Gorruckpore district, elsewhere I have not observed it. In its manners and habits it is similar to the common Mohoka, but its shape more comely by far."—*C. W. Smith's MS. Notes*.

"If, as I believe, not already named, I should propose the name of *Cen. Fasciatus*, when its trivial character would stand as follows:—

Cen. Fasciatus, Black Coucal, with brick red wings, barred with black.

Mr. Smith's next species is by far a more interesting bird, as it seems to form the connecting link between the ground and tree Cuckoos, partaking of the manners and general appearance of the former, and having the short hind toes of the latter. It will probably form a new genus of *Cuculidæ*; but in the meantime till this be determined, perhaps the name of *Centropus Cuculoïdes* may be admitted. Mr. Smith describes it as follows:—

"Measures sixteen inches in length. The bill is a bright vermillion slightly edged with yellow, and has a black spot about the centre of the edge of the upper mandible; there is a singular streak of minute white feathers forming a line from the nostril to the lower part of the eye: the latter is a dark brown, surrounded by white lashes. The plumage upon the crown of the head, the hinder part of the neck, the back, and wings, is a brownish satin colour, with black shafts; that on the throat, breast, and belly a faint orange, similarly marked; that of the tail dark grey, the two central ones wholly so, the next have white tips. The legs are slate coloured; and there is not the long claw remarked in the hinder toe of the preceding birds."

"I met with this species at the Bherah lake, in the Gorruckpore district, where it appeared to be pretty common, but I have not seen it elsewhere. It greatly resembled the Mohoka in its manner of running and flying. The natives, who delight in extraordinary stories, affirm, that it proclaims the morning, eve, and midnight hour by a pecu-

liar note; unfortunately I never happened to hear such a timed note.”
—C. W. Smith's MS. Notes.

Ornithological works being procurable with difficulty in India, I have chosen the most common for the few synonyms I have thought it necessary to give.—J. T. P.

CATALOGUE OF MAMMALIA

*In the Museum of the Asiatic Society. By J. T. PEARSON, Surgeon,
Bengal Establishment; formerly Curator of the Museum.*

NOTE.—This very meagre list contains only the few specimens of Mammalia that were in the Museum before I became Curator; that of the additions made during the time I held the office was unfortunately lost in the Ganges; and I have no copy.—J. T. P.

1. Class. MAMMALIA.

Ord. BIMANA.

Genus HOMO.

Sp. *Homo Sapiens*.—Man.

A mummied Head.

Presented by Lieut. Archbold, who procured it in the catacombs of Egypt.

2, 3, 4, 5. Ord. QUADRU MANA.

Genus SIMIA.

Sp. *Simia Gigantica*.—The gigantic Ape.

The skin of the face and left fore and hinder hands, and part of the skin.

Presented by Captain Cornfoot, who procured this specimen in the Island of Sumatra. The animal is described by Dr. Abel in the 13th Volume of the Researches of the Asiatic Society.

6. Genus SEMNOPITHECUS.

Sp. *Semnopithecus Melalophos*.—The Simpai.

A stuffed specimen.

The Simpai is described by Sir T. Raffles in the 13th volume of the Linnæan Transactions; and as far as can be made out (from its bad state) the present specimen agrees with his description.

7. Ord. CARNASSIERS.

Fam. CHEIROPTERA. Trib. VESPERTILIONES.

Genus PTEROPUS.

Sp. *Pteropus Edulis*.

The black Pteropus, or eatable Bat.

A stuffed specimen.

8.

Genus GALEOPITHECUS.

Sp. *Galeopithecus Rufus*.—The Colugo.

A stuffed specimen.

9.

Fam. INSECTIVORA.

Genus SOREX.

Sp. *S. Indicus*.—The Indian Shrew.

A stuffed specimen.

10.

Fam. CARNIVORA.

Trib. PLANTIGRADÆ.

Genus ICTIDES.

Sp. *Ictides Ater*.

Presented by Colonel Farquhar.

Mr. Wardlaw in the second volume of the Journal of the Asiatic Society, has given very satisfactory reasons for identifying this specimen with the *Ictides Ater* of F. Cuvier.

11. Trib. DIGITIGRADA.

Genus FELIS.

Sp. *Felis Kutas*.—The Kutas.

A mounted specimen.

Presented by Mr. J. T. Pearson. This animal is described by the donor in the 1st volume of the Journal of the Asiatic Society.

12. Fam. MARSUPIATA.

Genus THYLACYNUS.

Sp. *Thylacinus Cynocephalus*.—Part of the skin.

13. Ord. RODENTIA.

Genus RHIZOMYS, Gray.

Sp. *Rhizomys Sumatrensis*.

A mounted specimen.

Described by Sir T. Raffles in the 13th vol. of the Trans. of the Linnæan Society.

14. Genus HYSTRIX.

Sp. *Hystrix Fasciculata*.—Pencilated Porcupine.

A mounted specimen.

15. Ord. EDENTATA.

Genus MANIS.

Sp. *Manis Crassicaudata*.—The short-tailed Manis, or Pangolin.

A mounted specimen.

16. Sp. *Manis Crassicaudata*.—The short-tailed Pangolin.

A mounted specimen.

A good deal smaller than the last.

17. Ord. EDENTATA.

Sect. MONOTREMA.

Genus ECHIDNA.

Sp. *Echidna Hystrix*.—The Porcupine Ornithorynchus.

A mounted specimen.

18. Ord. RUMINANTIA.

Trib. CERVIDÆ.

Genus MOSCHUS.

Sp. *Moschus Javanicus*.—The Kanchil.

A mounted specimen.

18. Sp. *Mochus Javanicus*.—The Kanchil.

Another mounted specimen.

19. Trib. CAPRIDÆ.

Genus ANTELOPE.

Sp. *Antelope Thár*.—Native of Nepaul.

A mounted specimen.

Described in the Journal of the Asiatic Society, vol. iv. p. 489, by Mr. Hodgson of Nepaul.

20. Sp. *Antelope Thár*.—The Thar Antelope.

A stuffed Head and Neck.

21. Trib. BOVIDÆ.

Genus Bos.

Sp. *Bos Taurus*.—The Cow.

A mounted specimen.

A double-headed Calf, presented by ———

22. Sp. *Bos Bubalus*.—The Buffaloe.

A mounted specimen.

A double-headed Calf, presented by Major Gall and Mr. Sewell.

23.

Ord. CETACEA.

Fam. CETÆ.

Genus DELPHINUS.

Sp. *Delphinus Gangeticus*. The Gangetic Dolphin.

A mounted specimen, presented by MONS. DUVAUCEL.

The *Delphinus Gangeticus* seems to have been formed into a new genus: it is called the *Plantanistes Gangeticus* by Hardwicke and Gray, as has been before mentioned in the Osteological section of the Catalogue.

NOTE.—Owing to inadvertence, the Catalogue of Mammalia has been misplaced in its order of succession by the printer: it should have preceded the Ornithological Catalogue.



Inscription taken from a Baolee at Bussuntgurrh at the foot of the Southern range of Hills running parallel to Mount Aboo. By T. S. BURT, F. R. S. Captain, Bengal Engineers.

The indefatigable research, and unabated zeal of Capt. Burt, has put me in possession in this Inscription from Bussuntgurrh, of some new and curious information regarding the early dynasties of the Ranas of Mewar. Descended, as my readers need not be reminded, from the *Balhara* monarchs of *Saurashtra* (Surat and Guzerat,) the family destined to fix its seat of power at Chitore and Odeypore, sojourned for two hundred years in the Bhauder Desert after the destruction of that monarchy, until (Useful Tables, p. 109) "*Baph*, or *Bappa* conquered Chitore, and founded a new dynasty in A. D. 727." The list of titular potentates who headed the Gehlote or Jesodia tribe during the above period, from A. D. 524, when the Parthians destroyed the capital Balabhi in Sourashtra, to the date above noted, A. D. 727, is given by Tod from the *A'spur* marble (Rajasthan, vol.—p.—,) and he traces the succession of their princes from the *Aitpur* Inscription, after their conquest of Chitore in the following order :—

*Wilson's List.**Tod's List.*

- | | | |
|------------|-----------------------------|---|
| A. D. 750. | Guhila, | 1. Sri Gohadit. |
| | Bhoja, | 2. Bhoja (Bhagaditya.) |
| | | 3. Mahendra. |
| | | 4. Naga (Nagaditya.) |
| | | 5. Jyela. |
| | | 6. Aprajit. |
| | | 7. Mahendra. |
| | Kalabhaja, | 8. Kalabhaja. |
| | Bhartribhata, | 9. K ^H OMAN (invasion of Chitore from Ca-
bul, A. D. 812.) |
| | Samahagika, | Mangal, expelled by chiefs. |
| | K ^H UMAN, | 10. Bhirtipad, (founded thirteen principalities for his sons in Malwa and Guzerat.) |
| | | 11. Singhji, whose Ranee Lukshmi bore |
| | Allata, | 12. Sri Allat, whose daughter Haria Devi was grand-mother of |
| | Naravahana, | 13. Nirvahana. |
| | | 14. Salvahana. |
| 967. | Saktivarma, | 15. Saktikumar, 967 or 1,068? |

I have given these lists at length for facility of reference with respect to the suggested classification of the monarchs before inserting the Inscription itself. It bears date Samvat 1,099, or A. D. 1,042. The character is fairly cut, and in high preservation in the ordinary letter of the period. The reading by Pundit Kamalakanta Vidyalkanka is printed as usual in common Nagree to accompany the Translation.

My readers will observe, that in the genealogical lists above given of the ancestors of both Lahin and Vighraha, we find names entirely new to us as reigning monarchs in Mewar. In one or two only do we see coincidence or even resemblance with those of Tod's list, which Chronology will allow us to admit as identical with some names in our Inscription. The names of the countries, *Badari* the kingdom of Raja Sangna, and *Vada*, the residence of Poorna Pala, are new to us, and none of the Pundits whom I took much pains to consult were enabled to give me references sufficing to elucidate the difficulty; under the impression however, that they might by possibility be names of purely local application to tracts long unknown, as the sites of power, or the habitat of a numerous population, I begged Capt. Burt to oblige me by detailing, to the best of his remembrance, any circumstances attending his discovery of the Inscription, which might aid conjecture in coming to a satisfactory conclusion.

"The Bussuntgurbh Inscription was taken from a deep tank or baolee of moderate dimensions, almost entirely surrounded with jungle, and lying at the foot of that portion of (what Tod calls, as I understand him,) the Aravulli range of hills, situated nearly *opposite* the northern extremity of the mountain Aboo. The country contained between these two heights is, I think, and as far as Beejagnoh (Beejipoor by Tod, "the city of victory,") called Badari; for I think one of the Sawars, (belonging to the Kawul of Sirohee,) who attended me during my pilgrimage, gave it that name, in contradistinction to that of the country lying on the other, or western side of Aboo, and stretching out to Neebach, or Neemuch, (not our cantonment of course) but a dependency I believe of the Sirohee Raj. In the first mentioned, the country is covered with jungle, and in the latter *comparatively* open, that is, after clearing out a few miles from the base of the mount, which is entirely surrounded by forest trees, as well as almost impenetrable grass, rendering a descent from Aboo a dangerous operation at the end of the rains, (being once there,) on account of the malaria generated by the evolution of mephitic gas from the rife vegetation there, and similar to that of the Terai below Nipal, and the forests between this and Bombay."

Here then we have *Badari* recognised as the modern local appellation of the tract of country near about the site of the Inscription. As to attempt-

ing to trace with accuracy the genealogy now before us in that of the line of princes whom we can already number with certainty as among the rulers of Mewar, I own that at present, without other sources to refer to, the effort does not seem likely to be attended with success. I did not fail to consult my friend, Lieut. Cunningham, (Bengal Engineers,) than whom I know no one more capable of giving a sound opinion upon a case of historical or chronological difficulty. Without going into the detail of a very ingenious calculation, (which I prefer keeping back until the contents of another Inscription be fully ascertained, which I hope may throw light upon that of Bussuntgurh,) I will merely state two of Lieut. Cunningham's positions, as being both exceedingly well founded. "Bhirtripad," he observes, "founded thirteen principalities for his sons, and I am inclined to suppose your new dynasty to be one of the branches of his family." The same idea occurred, I must own to myself, on first studying the genealogy, and evidence of the existence of petty states, "the land of *Badari*," and "the city of *Vada*," which we find recorded in an age immediately succeeding Bhirtripad's in the Bussuntgurh Inscription, A. D. 1,042, proves the correctness of the information we have, and gives a natural idea of the state of the country, after the attack of Chitore, A. D. 812, in the reign of Khoman, when after the expulsion of the temporary sovereign *Mongal*, the next successor found himself compelled to subdivide his authority, weakened by the anarchy and confusion of the twenty years preceding.

Lieut. Cunningham again accounts for the want of agreement between the names on the Bussuntgurh Inscription and those recorded in the "Useful Tables," by pointing out that "the Rajas in James Prinsep's list, (after Sri Allat) are descended on the female side, whereas in the Inscription they would appear to be heirs male." I would not readily hazard a conjecture where further researches for the evidence of Inscriptions is almost certain to be productive of fact established on the surest grounds. One can only hope that those who have the opportunity will not allow it to escape them, when at a slight expense of exertion, the ancient history of one of the most interesting portions of India may be by their efforts, as so often by Capt. Burt's, greatly elucidated.



Literal Translation.

1. I, Matri Sarmá, a poet and the son of Hari, having offered salutations to Váni, (the goddess of wisdom,) who is propitious to the learned, made this eulogy.

2. May Hari, the illuminator of the three regions, who is himself the sun (or the only object of speculation to the astronomers) Sivá to

Saivas (or the followers of Sivá,) to be known by intuition and meditation, remover of sins, illustrator (creator) of all, great, knowing all human virtuous dispositions, and surrounded by the *Vasooos*, *Kinnaras*, and *Sidhas*, and whose divine truth is unveiled to the wise,—protect you !

3. From the wrath of *Vasisthá** was born a son * * * * * and from him sprang many powerful Rajas.

4. From *Utpala Raja*, one of the descendants of this line, sprung one named *Aranya Raja*, and from him was born *Adbhúta Krishna Raja*, who was renowned like *Vasudeva*, (Krishna).

5. His son, who was famous, noble, and whose name was *Srínáth Ghosi*, had also a son named *Mohípála*, from him was born *Raja Vandhuka*.

6. Whose fame is still to be sung aloud even in the region of the gods, by the well-dressed and adorned goddesses, as well as by the females of the *Kinnaras*, having lutes in their hands.

7. He by his might easily carried off the *Lakshmi*, (Fortune,) of his enemies, though they assembled a numerous army. His beautiful wife, whose name was *Ghreta Devi*, was of a mild disposition and a noble family.

8. From her and *Vandhuka* was born *Púrnapála*, who was always content, famous, and the supporter of all ; who also acquired the name *Valadarpada*, for his having fought battles and possessed kingdoms of (his enemies.)

9. His fame in the assembly of *Indra*,† is always sung by the god-

* Note by Pundit Kamalakanta on the sloca 3 of the above. “From the wrath of *Vasistha*.”

The following sloka are extracted from the 13th section of the 9th chapter of *Srimat Bhágvat* :—

Niní, the son of *Ikohákú*, having commenced a *jagna*, (a secret ceremony), wished to acknowledge *Vasistha* as his priest for its performance, who instead of complying with his request, said that he has, prior his petition, been bound to perform the ceremony commenced also by *Sakra*.

And further that he must wait till the same was over.

But *Niní* being sensible of the instability of worldly pursuits, determined to have it (the ceremony) performed by another priest.

Whereupon *Vasistha* on his return (from the kingdom of *Sakra*) found *Niní* to have broken his promise, cursed him to loose his life.

From the dead body of *Niní*, which was thus separated from life and (afterwards) churned by the gods, was born a son. * * * *

† The chief of the gods.

desses, who are all beautifully adorned with the golden flowered ornaments and with lutes in hands resplendent with jewels.

10. He (Púrna Pála) placed at the gate of his palace the strong elephants exuding ichor from their temples, of his enemies, whom he has easily slaughtered in several battles. To him, who was the illuminator of the Pála line, and most eminent within the whole Arryaváta, the *Srí Lakshmí* was, as it were, the governing queen.

11. His younger sister named "the queen Láhíní," who was as it were the Lakshmí herself, but without the seat of lotus, was married to *Raja Vighraha* as *Lakshmí* to *Krishna*.

Here follows the lineage of *Begraha* :—

12. There was a celebrated *Kshetriya* named *Kásiswara*, who was most powerful, subduer of his enemies, and superior to all the other Rajas, and who for his heroic disposition gained fame throughout the whole world.

13. From his line descended *Raja Bhabagupta*, who was renowned for his good counsels, illuminator of his line, and a great warrior. He repaired the image of the *Sun*, established in some forest adjacent to *Vada*, where he reigned for a length of time.

14. From the line of *Bhabagupta*, sprung *Raja Sangana*, who gained the kingdom of *Badari*, and was himself respected by all. His son was *Ballabha Raja*, who also had a son named *Chara*, and from *Chara* was born *Bara Raja*.

15. From *Bara Raja* was born *Vighraha Raja*, who was respectable for his noble qualities, and the king of kings; and whose good name which he acquired by the power of valour, noble qualities, and liberality, has far surpassed the regions.

16. He, *Vighraha Raja*, was always attended by people of a good nature, and fond of many wives; he made his two lines, both paternal and maternal, honorable, and was beautiful in person, ruler of the world, very strong, superior to mankind, and like *Mádhava*, (*Krishna*), in disposition, though a man.

17. He, *Vighraha*, having gained so merited a wife, *Láhíní* (as above mentioned,) enjoyed her, and she too being married to so desired a lover as *Vighraha*, who was like *Indra* in the earth, (was likewise happy.)

18. She soon after the sudden demise of her husband, being deprived of all sorts of happiness in the world, at last took her abode into the residence of her brother at *Vada*.

19. This line, from which sprung *Raja Vasistha*, was also denominated "Vasistha line."

20. In Vada, the shrine of *Nagradha* is to be found. There *Vasistha*, who was great, established the images of the *Sun* and *Siva*, who yield salvation, and caused the temples, palaces, walls, forts, &c. to be erected, and tanks to be dug.

21. There further the Brahmanas, who have completely studied Vedas, which are difficult, were in no instance proud.

22. *Vadapoor*a, which is inhabited by people who are virtuous and attentive to their faith, and as well as by musicians, heroes, and warriors, &c. and commodiously situated for commerce, was looked at as if the second heaven.

23. Near this is the river *Saraswati*, having a ghaut constructed by the *Raja*, its water was adorned with the flowers for worship, nay, it is as if the mother to the Brahman females.

24. Here the inhabitants, who are all patriotic, wise, mild, addicted to worship the gods and Brahmanas with the gifts of variety, and renowned for talents, are always devoted to *Bhanu*, (the Sun.)

25. Here the queen *Ldhini* mourning the death of her beloved consort arrived, accompanied by Brahmanas, and being sensible of the instability of worldly pursuits as well as of life.

26. Repaired the old temple of *Bhānu*, which had been once more repaired by *Vasistha* when fallen down by time.

27. This temple of *Bhānu*, which was strongly built of bricks and stones, when completed exhibited the colour of clouds, and was so beautifully perfected that it resembled Himalaya, the mountain where *Siva* resides.

28. Its staircase, which is beautiful as ought to be in its kind, and built of stones, is like that of the gods, which are not to be found elsewhere.

29. Further, she for the promotion of virtue, transformed the river *Saraswati* into a tank, which was useful to the gods as well as to men, and removing sin (by its water.) Its waves were so lofty, as if they were to touch the firmament.

30. She being conscious of the instability of the world, has performed this deed of virtue by the expenses of her own.

31. So long as the *Surabhi** shall continue to graze in the region of cows, and the waves of the seas agitated by the wind, the sun with his one-wheeled car shall endure, so long shall this tank exist, the water of which is pure as the rays of the stars.

32. This eulogy was made by Matri Sarmá, a Brahmana, who was the son of Hari, and the well-wisher of Láhíní for the benefit of all.

33. It was engraved by Sivapála, the son of *Dorhaka*, who had his dwelling in the fort of Raja *Aswapati*, in the Samvat year 1099.

AN ABSTRACT BY KAMALAKANTA PUNDIT.

Literal Translation.

The particulars of the *Janaka* Rajá's birth are already detailed in the preceding slokas, extracted from *Śrīmat Bhāgavata*.

From the line of this *Janaka* sprung many powerful Rajás, from some of these was born Rajá *Ootpala*; from *Ootpala*, *Aranya* Rajá; from *Aranya* Rajá, *Adbhúta Krishna* Rajá; from *Adbhúta Krishna* Raja, *Vasodeba* Rajá; from *Vasodeba*, *Srinátha Ghosi*; from *Srinátha*, *Mohepála*; and from *Mohepála*, *Vandhooka*; from his wife named *Ghrita Devi*, was born Rajá *Purnapála*; whose younger sister was *Láhíní*, the restorer. Here also follows the lineage of *Vigraha* Rajá, whom she had been married to, but unfortunately for a short duration, when he, (*Vegraha* Rajá,) departed this life, leaving *Lahíní* a widow, who from that time took up her abode into the residence of *Purnapála*, her brother. The lineage is this. There was a Rajá named *Kásiswara Dwijáte*, and from his line descended a Rajá named *Bhagogúpt*, who had also once repaired this very temple of *Bhanu* (Sun) in the forest of *Vadapura*, where he had reigned for a while. From him sprung *Sambara*, a Rajá who also ruled the country of *Vadari*. From *Sambara* was born *Ballabha* Rajá, who had a son named *Chara*, and from *Chara* was born *Vara* Rajá, and from *Vara*, *Vegraha* Rajá, the husband of *Láhíní*. It was she who caused the temple of *Bhanu*, formerly established in the forests of *Vada* to be repaired, as well as a reservoir of water made therein.

* An eternal cow, yielding every thing desired.

नागराक्षरलिखितवसन्तगडदेशीय प्रशस्तिः ॥

प्रणम्य हरिपुत्रेण कविना मातृशर्मणा । सुहृद्विततरां वाणीं
प्रशस्तिः सुकृता मया ॥ ज्योतिर्ज्योतिर्विदां भवः शिवधियां दृष्टः परं
चक्षुषा तत्पाराधनतः स्मृतः कलुषहा सर्वप्रकाशो महान् । तत्
ज्ञानमसंवृतं मतिमतां ज्ञाता च सत्कर्मणां पायादो वसुसिद्धकिन्नर
युतसैलोक्यदीपो हरिः ॥ वसिष्ठकोपाज्जनितः कुमारः : : :

: : : : : (भुम्यां) महावला यत्रनृपा वभूवुः ॥ अस्यान्व
ये ह्यत्पलराजनामा आरण्यराजो ऽपि ततो वभूव । तस्मादभूदङ्गत
वृष्णराजो विख्यातकीर्तिः किलवासुदेवः ॥ तस्यात्मजो भूवल्लय
प्रतिष्ठः श्रीनाथघोषी वृतवान् वराण्यः पुत्रोऽपि तस्मान्महिपाल
नामा । तस्मादभूदन्धुकएव भूपः । अस्यापि कीर्तिः सुरराजलोके
प्रगीयते वै सुरकिन्नरीभिः । वीणानिविष्टं करजांगुलीभिः । विमुक्त
कण्ठोभिरलंकृताभिः । येनाहृता शौर्यवलेन लक्ष्मीर्विख्याप्य भारं
परसैन्यमध्ये । अस्यापि भार्या घृतदेविनाम्नी रूपेण शीलेन
कुलेन युक्ता । तस्मादमुष्यांभुविपूर्णपालः पूर्णो नृणां पालयशोभिपूर्णः ।
महारणेनापि विजित्य राष्ट्रं नामा ऽपि भूतं वलदर्पदेति ॥ कनककर्णि
कभूषिततारया करपदेमणिभूषितवीण्या । विबुधराजकुले सुर
कन्यया सदसि यस्य यशः खलु गीयते ॥ हत्वा येन रिपून् युधा च वज्र
शः प्रख्याप्य भारं स्वकं विक्रान्तामदशालिनो वरगजानद्वाः स्वके मंदि
रे । पूर्णः पालकुलप्रदीप इव यो ऽप्यार्यावते धार्मिके । अत्रश्रीः पर
मार्थवंशतिलकेराज्ञीस्थिरा शासति । अस्यानुजालाहिनिनामराज्ञी
लक्ष्मीर्यथा तामरसैर्विहीना । ऊढापि या विग्रहभूभुजेन सत्या यथा
पूर्वमधोल्लजेन ॥ अस्यान्वये ऽपि ॥ आसीद्विजातिर्विदितो धर
ण्यां ख्यातप्रतापो रिपुचक्रमर्ही । योदुःखशौर्याज्जितभूयशस्यः का
शीश्वरः सर्वनृपप्रधानः ॥ तदन्वये ख्यातमतिर्नृपो भूत् कुलप्रदीपो भव
गुप्तनामा । उद्धृत्य वेशं वनवासिभानोर्वदेषुराज्यं हतवान् स वीरः ।

अस्यान्वये संगनराजनामा वन्द्योनरैर्यौवदरींसमाप्तः । तस्माद्भूदक्ष
 भराजभूषश्चरोपितस्माद्वरराजभूषः । वभूव तस्माद्गुणिताप्रधानो
 नृपोत्तमोवियहराजनामा । प्रदानशौर्यादिगुणैरुदारैर्यशोययौ
 यस्यविजित्य लोकान् । द्विजिक्करिपुवाहनो ललनकान्तरापूजितः
 कुलदयह्यतोन्नतिर्विधृतचारुलक्ष्मीवपुः । स्वपौरुषधृतावनिर्व्वलनि
 विष्टवक्षामहान् वभूव नृवरोत्तमः स नररूपधृङ्माधवः ॥ भाव्यांसचा
 वाप्य गुणैः समेतां वितोषितां वै वुभुजे च भोगं । सापि प्रियं प्राप्य
 पतिम्बरेण यद्वन्महीन्द्रेण समंचरेमे ॥ अस्मिन्मृते भर्त्तरि दैवयोगाद्
 भ्रातुर्गृहं सा प्रियतावियुक्ता । आवेशिता वै नगरे बदेऽस्मिन्दैवात्
 प्रहीनैवसुखक्रमेण ॥ वसिष्ठराजोपि अत्रासीदतोयंवसिष्ठराजान्वे
 यो यपि (जातमत्रपावारुणिनापि) अत्र न्यग्रोधस्याश्रमः ॥ ॥ स्थाने
 कर्मर्गा स्वमतौ वसिष्ठोमुक्तिप्रदौस्थापितवान् वरिष्ठः । तद्वददाख्य
 नगरेवने अस्मिन् वज्रप्रसादान् ह्यतवान् वसिष्ठः । प्राकारवप्रोपवनै
 स्तडागैः प्रासाद (वेश्मैः) सुघनैः सदुर्गैः ॥ अतिमन्त्रोदमक्षोभ्यं पार
 गावक्रमाकुलं । वेदार्णवं द्विजाः सम्यग् यत्र तीर्णाप्यगर्व्विताः ॥ लोकै
 र्धर्मपरैः स्वकर्मनिरतैः सद्भिः सदावासितं । आवृत्त्याजनसम्मतैः
 प्रतिदिनं नित्यं वणिग्भिवृत्तं । पौराणैर्गणिकाजनैर्व्व्यसनिकैः शूरै
 र्जनैः संकुलं स्वर्गस्थानमिवापरं वदपुरंचौणीतले संस्थितं । मरुद्ग
 ता यत्र सरित्सरस्वती सोपानपंक्त्याचनृपेण निर्वृता । सुपुण्य पुष्पोदक
 फेणवाहिनी द्विजायमाना जननीववेष्टिता ॥ ये सर्व्वं पालयन्ते नगर
 हितरतानीतिमन्तः प्रशान्ता देवान् विप्रान्यजन्ते वनभवनमहीवस्त्र
 रत्णादिदानैः । स्थातायेचैव नित्यं त्रिभुवनवलये सदगुणैरेवनीताः ।
 तेस्मिन्पौराः समस्ताः सकलजनहिताभानवे भक्तिमन्तः । सात्रागता
 लाहिनिनामराज्ञीर्भर्त्तुर्व्वियोगेन निपीडितांगी । अस्मिन्पुरे विप्र
 जनैः समेत्य दृष्ट्वा तुतोषान्तरनात्मवुद्ध्या भानोर्गृहं दैववशादिभक्तं
 वसिष्ठपौरैः सुहृतं यदासीत् विनाशिसर्व्वं सहजीवितेन ज्ञात्वागृहं

कारितमाशुभानोः लोकप्रयोगा सुकृता दुरापा सुस्निष्टसन्धीघटि
तोत्पलेव । सोपान पंक्तिः शुशुभे सुवद्वा निश्रेणिभूतेव दिवौकसा
नां ॥ देवैः समस्तैर्मुनिभिश्च जुष्टा पापापहा व्याप्यवियत् स्थिता या
जीवैर्वृता लाहिनिपुण्यहेतोः सारस्वती शेषजनस्य वापी । निष्पा
द्य सुकृतौ कृत्वा अर्थदत्त्वा पुनःपुनः : : वैनाशिकमिदंचान्यज्
ज्ञात्वालोकस्यचर्चितं ॥ यावद्गोलोकवृत्तीः प्रवहति सुरभिर्यावद्
कोन्तरीक्षे । यावद्दीच्यः ससुद्रे पवनविधुनिताः संतताः प्रोच्छलन्ति ।
यावद्बोम्नि प्रदीप्तं प्रवहति मिहिरस्यंदनस्यैकचक्रं वाप्येघातावद्
क्षणमुडुकरसदृशी कारकस्यातिकांता । कृतेयंहरिपुत्रेण मातृशर्म
द्विजम्नना सुविलोकहितार्थाय लाहिन्याश्चहितैषिणा । आसीच्चना
माश्वपतेः सुदुर्गेदुर्गाकृती दोडकसूत्रकारः । अस्यापिसूनुःशिवपाल
नामा यनोत्कृतेयंशुशुभाप्रशस्तिः ॥ नवनवतिविह्वासीद्विक्रमादित्य
कालेजगति दशशतानामयतोयत्रपूर्णा । प्रभवतिनभमासे स्थानकेचि
त्रभानोः स १०६६ ॥

अस्यसंक्षेपः ॥

वसिष्ठकोपाद् यथा जनकोजातस्तद्वृत्तांतः श्रीभागवत नवमस्कंद
श्लोकेभ्यश्चवर्गंतव्यः ॥ जनकवंशे महावल्लाराजानो वभूवुः । तदेक
तमवंशे उत्पलनामा राजा तत्पुत्रः आरण्यराजः तत्पुत्रः अद्भुत
कृष्णराजः । तत्पुत्रो वासुदेवराजः तत्पुत्रः श्रीनाथघोषी तत्पुत्रो
महीपालः तत्पुत्रो वंधुकस्तस्य भार्या घृतदेवी वंधुकात् घृतदेव्यां
पूर्णपालनामा राजा पूर्णपालस्य अनुजाभगिनी लाहिनी वियह
नाम्ना राज्ञा विवाहिता । वियहराजे मृते लाहिनी विधवा तस्य
पूर्णपालस्य भ्रातुर्गृहे स्थितवती । वियहराजस्य पूर्वपुरुषाणां कथा
यथा ॥ काशीश्वरो द्विजातिराजआसीत् तदंशे भवगुप्तो येन वद

पुरेवनवासिभानोजीर्णद्वारः कृतः । वदस्य राज्यं च स्वीकृतं तदन्व
ये संवरनामा राजा स वदरीराज्यमाय तस्य पुत्रोवल्लभराज स्तस्य
पुत्रः श्वरः तत्पुत्रोबरस्तत्पुत्रोबियहराज स्तत्पत्नी लाहिनी
वदेष वनवासिभानोर्मदिराणां जीर्णद्वारं एकांवापीं च कृतवती ॥

Proceedings of the Asiatic Society.

(Wednesday Evening, 11th August, 1841.)

The Honorable Sir E. RYAN, President in the Chair.

FLETCHER HAYS, Esq. 62d N. I. Junior Assistant Governor General's Agent, Saugor, was proposed a Member by DR. J. McCLELLAND, seconded by DR. J. GRANT.

HENRY WALKER, Esq. Surgeon to the Governor General's Body-guard, was also proposed a Member by DR. J. McCLELLAND, seconded by the Secretary.

Library and Museum.

Books received for the Library of the Asiatic Society, for the Meeting on the 11th August, 1841.

Jamieson's Edinburgh New Philosophical Journal, No. 59, January 1841, 1 vol.

London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 3d Series, Nos. 115 and 116, Vol. 18th, February and March 1841, 2 vols.

Calcutta Christian Observer, New Series, Vol. 2d, No. 20, August 1841, 1 vol.

Map of the Provinces of Bengal and Behar, by J. B. Tassin, Calcutta, 1841, 1 vol.

Annuaire des cinq départements de L'Ancienne Normandie, 1839, 5e. Année, Caen 1839, 1 vol.

Acts de L'Académie Royale des Sciences, Belles Lettres et Arts de Bordeaux, 1re. Année 1re. à 4re. Trimestre, Paris, 1839, 4 vols.

Extrait des Séances de la Société Royale D'Agriculture et de Commerce de Caen, par M. Lair, 19 Janvier 1838, et 18 Janvier 1839, (2 copies each,) 4 vols.

Reponse de M. P. A. Lair, a une lettre de M. Mercer, Caen, le 30 April 1840, 1 vol.

Société Royale D'Agriculture et de Commerce de Caen. Rapport sur le 2d volume des Institutions Hippiques, Janvier à Juin 1840, 6 vols.

Ditto ditto Programme de deux Concours, 1840, 1 vol.

Extrait des Rapports faits par M. Levardois, 1840, (2 copies,) 2 vols.

De L'Extinction de le Mendicité, par M. Lecerf, Caen, 1840, (2 copies,) 2 vols.

Hammer Geschichte der Goldenen Horde in Kiptschak, des ist der Mongolen in Russian Pesth, 1840, 1 vol.

Moorecroft's Travels in the Himalayan Provinces, &c. in 2 vols. (10 copies,) 20 vols.

Humboldt über die Kawi—Sparche auf der Insel Java, vols. 2d and 3d, 2 vols.

Transactions of the Royal Irish Academy, vol. 19th, part 1st, Dublin, 1841, 1 vol.

Wight's Icones Plantarum India Orientalis, or Figures of Indian Plants, vol. 2d, parts 1st and 2d, 2 vols.

Reports and Abstracts of the Proceedings for investigating Coal and Mineral resources of India, May 1841, Calcutta, 3 copies, 3 vols.

Madras Journal of Literature and Science, No. 29, October and December 1840, 1 vol.

Yarrell's History of British Birds, part 24, London.
Oriental Christian Spectator, vol. 2d. No. 6, June 1841, 2d Series, Bombay.
Annals and Magazine of Natural History, No. 42, April 1841, London, pamph.
Calcutta Monthly Journal, for June 1841, 3d series, No. 79, Calcutta, 1 vol.
Hammer's Gemäldeaal, Funfter band Leipzig, 1838, 1 vol.
First Report of the Elphinstone Native Education Institution 1840, Bombay 1840, pamph.
Jahrbücher der Literatur, 1839, parts 85 to 88, 4 vols.
Journal des Savants, December 1840, Paris, pamph.
Société de Geographie Recueil de Voyage et de Memoires, tome 6, 1 vol.
Hádiakoon Najoon (Persian,) 1 vol.
? Chintamoney, (Sanscrit,) pamph.

Read the following Report submitted by the Officiating Curator :—

H. TORRENS, Esq.
Secretary Asiatic Society.

SIR,—For the month of July I have the honor to report as follows :—

Geological, Paleontological, and Mineralogical.—We are, I am glad to say, approaching the completion of the Geological series of our Catalogues, and some of the Mineralogical and Paleontological ones are also ready for the press. We are sadly impeded by the difficulties of deciphering labels, ascertaining collections, and by the printers. The Index to the whole of the Geological, Mineralogical and Paleontological papers in the Transactions, Journal, and Gleanings of Science is printed, and a copy is on the table. Our Secretary informs me it is his intention to print it in the Journal. I have also at his request been occupied this month with a paper on a fossil elephantine jaw from Jubbulpore, sent down by Dr. SPILSBURY, which in my limited knowledge of the subject, I am inclined to suppose may belong to a new species or variety ? It is at least a piece of justice to Dr. SPILSBURY, who has done so much for the Museum, and for the Geology and Paleontology of Central India, that we should record in the fullest manner every thing relative to his contributions ; and Mr. TORRENS has in this view been good enough to allow me to go to the expence of a plate to explain my views.

Osteological.—The Skeleton of the Neel-Ghye is completed.

Ornithological and Mammalogical.—Nothing new to report.

Museum of Economic Geology.—We have at length obtained here five, out of seven, cases from the Native contractor ; and with the exception of a few trifling arrangements, I may say, that this part of the Museum is arranged. The Catalogue will also be completed in a few days.

Travelling Taxidermists.—At the end of the month of June we dispatched a Mr. GOMES, who had been employed by Dr. HELPER, as taxidermist on account of the Society, to Lieut. TICKELL, at Chyebassa, with a complete supply of every thing for his work, and a book of instructions. At Midnapore however he appears, according to Dr. PAGAN's account, to have taken fright at the stories of tigers and jungles, &c. if he went alone ; and he returned to Calcutta, with the excuse, that he could not procure carriage, &c. We have however dispatched him again with two good men for his companions, and he will no doubt arrive safe. This return and delay has made his dispatch expensive, but a part of the expence is experience bought for future use.

Memorandum.—The expence including two months' pay in advance, is in round numbers as follows :—

	Rs.	As.
Book and tools, &c.,	10	0
Two Month's advance and travelling expences,.....	62	0
Total,.....	72	0
Return and re-dispatching,	48	0
	Co.'s Rs.	120 0

Additions to the Museum have been as follows :—

Osteological.—Skeleton of the Neel-Ghye.

Mineralogical, Geological, and Botanical.—Coal, sandstone, limestone, iron-ore, garnets, hemp, dyeing drugs, &c. from the Chinnoor Sircar, collected by Dr. WALKER, presented by Government.

Museum Economic Geology.—Soils from Assam Tea Company.

Yours obedient servant,

MUSEUM, 31st July, 1841.

H. PIDDINGTON.

At the recommendation of a Sub-Committee the following order as respects the Numismatic Collections of the Society was recorded for future observance ; viz. " That no coins be removed from the apartments of the Society without special permission for a special purpose, on a written order given on the responsibility of the Secretary."

A sample of a Table Cabinet (invented by the Secretary) for containing the Coins was submitted to the meeting, and one like it ordered to be prepared.

Read titles of BARON DE HAMMER'S works prepared by DR. ROER, which the Secretary intimated he would publish in the Journal for the information of the curious, and should inquiry be made for any particular subject, that he would publish a translation of the same with the assistance of DR. ROER, who had kindly offered his services.

Read a letter from Mr. Secretary BUSHBY, of the 23rd June, 1841, forwarding an Extract from a Dispatch of the Honorable the Court of Directors of 28th April, 1841, expressing their wish to receive a selection of specimens of Fossil Geology of India, for their Museum at the India House.

Ordered,—That the Government be informed in reply that the Society would bear the request in mind.

Read a letter from Mr. Secretary BUSHBY of the 21st July 1841, with enclosures, requesting the opinion of the Asiatic Society as to the Inscription to be placed on Bheem Sing's Lath at Allahabad, adding at the same time, that "the Right Honorable the Governor General in Council would be unwilling to add any Inscription to the Lath itself."

Ordered,—That a communication be made in reply, that the Society concur in opinion with His Lordship in Council, that no Inscription should be on the Lath.

Read a letter of the 13th May 1841, from Moonshee RUTTUN SING BAHADOOR, of Lucknow, accompanied with a work compiled by him on Geography and Meteorology, which he offered for the kind acceptance of the Society, "as a humble token of the high admiration and respect in which the Society is universally held."

Ordered,—That the civility be reciprocated by the presentation to Moonshee RUTTUN SING, with a bound copy of the Transactions of the Society.

Read the following papers, the greater part of which were received by the Secretary as Editor of the Journal.

A Note on the Fossil Jaw of an Elephant sent from Jubbulpore by Dr. SPILSBURY, by the Officiating Curator. This was illustrated before the meeting by Crania of Fossil and recent Elephants, and by copies of the drawing made by the Officiating Curator to accompany his note.

Letters of 6th July 1841, from Dr. H. FALCONER of Seharunpore, and H. PIDDINGTON, Esq. Officiating Curator, on the subject of the late grand Cataclysm on the Indus, described as one of the most remarkable natural phænomena hitherto recorded as having occurred on the continent of India. The Secretary stated, "that having communicated with the Private Secretary to the Right Honourable the Governor General, he had the satisfaction of stating, that LORD AUCKLAND had personally addressed Mr. CLERK, (Political Agent on the N. W. Frontier,) on the subject at length, requesting that inquiries may be made, and suggesting modes of conducting it.

N. B.—The Secretary has since learned that before the receipt of LORD AUCKLAND's letter, Dr. JAMIESON had been deputed by Mr. CLERK, for the purpose of investigating the causes of the Cataclysm.

A letter from Lieut. POSTANS, of 5th July 1841, with a Translation of the History of Sindh, (*Chuch Namuh*). This interesting work has already appeared in an abridged form in the Journal. The Secretary begged to state, that he would be happy to place this valuable paper at the disposal of the Committee of Papers, for publication in the Transactions of the Society. Referred to the Committee of Papers.

A letter from Capt. SHORTEDE, of 24th July 1841, forwarding a new Table of Proportional Logarithms, composed by himself.

A Note on the Cerous Elaphus, by B. H. HODGSON, Esq.

A letter of 17th July 1841, from JAMES MIDDLETON, Esq. forwarding Copy of the Sanscrit Treatise, shewing the use of the silver Astrolabe from Kotah, now in the possession of the Society, which Mr. M. had been unable to meet with when he wrote his remarks (published in the Journal) on this curious instrument.

An account of Arracan, by Lieut. PHAYRE.

A letter of 30th July 1841, from Capt. J. S. BURT, in reply to one from the Secretary regarding the Inscription at Bussuntgurb near Mount Aboo, as also a letter from Lieut. A. CUNNINGHAM of 18th July 1841, connected with the above subject. The names of princes reigning in Odeypore, recorded in this Inscription are new, and will it is believed be proved satisfactorily to supply the hiatus after *Bhritiprad*, and *Allata* in Tod's and Prinsep's (Useful Tables) Genealogical Lists.

Specimen of a short History of the Emperors of Hindostan to the reign of Shah Allum the Blind, by Mr. THOMAS CONLAN. It was suggested that this paper should

be laid before the Committee of Public Instruction, in case it might be found expedient to communicate with Mr. CONLAN.

Read letter from Dr. ROER, Librarian, reporting progress in the classification and arrangement of Books in the manner proposed by him.

Ordered,—To be referred to the Committee of Papers for consideration.

Read a letter from Mr. Secretary MADDOCK of the 2d August 1841, forwarding for deposit in the Society's Museum, and for such notice in the Journal as they may seem to deserve, a collection of Specimens of Minerals collected by Lieut. BIGGE, Assistant Agent to the Governor General, North East Frontier in the Cachar Hills, together with a report on a portion of them by Capt. TREMENHEERE.

Read a report by Mr. JAMES HYLAND, on the Coal Deposit of Cap Island in Arracan, with specimens of Rocks of the same and other places.

Read letter from Messrs. ALLEN AND Co. of London, of 31st May 1841, advising the dispatch of a parcel of Books, presented to the Society by Dr. FREYTAG, Professor at the University of Bonn on the Rhine.

Ordered,—That the thanks of the Society be accorded to the Professor, and that a selection of the Works of the Society be presented to him in return.

The Officiating Curator submitted for the inspection of the Meeting the Geological Catalogue, and Index to the same prepared by him, which would appear in the Journal. The Secretary was requested to take that opportunity to print 300 extra copies for general use.

For all these contributions and presentations thanks were accorded.

JOURNAL

OF THE

ASIATIC SOCIETY.

*Account of Arakan.** BY LIEUT. PHAYRE, *Senior Assistant Commissioner, Arakan.*

Arakan Proper, called by the natives *Ra-khoing-pyee*, or Ra-khoing country, lies between 20° and 21° 10' N. Lat. on the sea coast; in the interior it extends to about 21° 40'. It is bounded on the west by the Bay of Bengal and the estuary called Naf; on the north, by a range of mountains named *Wé-la-toung*, and by a line not well defined running N. E. through a hilly country to the *Kola-dan* river; on the east by the *Yú-ma* mountains; and on the south it is separated from the district of *Aeng*, and the island of *Rambree*, by various straits and creeks.

On the north, between *Arakan* and the *Chittagong* district, at some distance from the sea-coast, there are several tribes living among the hills and forests, who have hitherto remained independent of the British government. Our authority extends up the *Kola-dan* river, about 130 miles north from the town of *Akyab*, to the mouth of a stream called the *Oo-tha-lang*, but beyond that, stretch mountains and forests to the north-east, hitherto untrodden by civilized man, as far as *Munneepoor*; here live various savage tribes, who appear to be in a constant state of warfare with each other. On the east our boundary up to the *Yú-ma* mountains is only nominal. The tribes

* We give the name *Arakan* as a general term to four districts, which by the natives is restricted to what is the present district of *Akyab*. In this paper the name *Arakan* is used in the latter sense.

for 15 or 20 miles west of that range are independent, and have never submitted to any regular government, neither to that of the *Arakan* kings, the Burmese, or the British.

The boundary above described contains about six thousand square miles, of which from 12 to 1500 on the eastern side, are, from the inaccessible nature of the country, under the controul of the mountain tribes.

In *Arakan* there are three principal rivers; viz. the *Mayú*, the *Kola-dan*, and the *Lé-myo*; these all flow in a general north and south direction, at an average distance of 15 or 20 miles apart, the *Mayú* being to the west, the *Kola-dan* in the centre, and the *Lé-myo* to the east. Their channels are separated by ranges of hills running in the same general direction of N. and S.; the principal rocks are sandstone and shale.

In the upper course of these rivers, or about 150 miles from the sea, the hills are lofty, and so massed together, that the direction of the ranges is not discernible; but as the rivers descend, the country becomes open; then ascend a height; and single ranges of hills are seen, with broad and fertile plains extending from their bases as far as the eye can reach; the plains, dotted here and there with villages, are intersected by innumerable streams, and the bright-green rice fields, alternate with dark forest tracts. The three rivers for the last 20 or 30 miles of their course, are connected together by a vast number of creeks, through which all communication in the delta takes place. The *Kola-dan* in the lower part of its course is called the *Ga-tsha-bha*. The different branches of the *Lé-myo* in its lower course take various names.

The ancient history of *Arakan* presents such a tangled web of fiction, that I shall not attempt to give it in detail. I have not had sufficient leisure to study the subject, and my object being merely to give an account of the present state of the country, I shall only refer to its ancient history so far as is necessary to give a general idea of its condition previous to the British conquest, and to shew what race the present inhabitants belong to. The inhabitants are,

In the Plains.—1. *Ra-khoing-tha*.—2. *Ko-là*.—3. *Dom*.

In the Hills.—1. *Khyoung-tha*.—2. *Kúmé* or *Kwé-mé*.—3. *Khyeng*.—4. *Doing-núk*, *Mroong*, and other tribes.

The *Ra-khoing-tha* and *Khyoung-tha* are of the same race. Like the Burmans their national name is *Myam-má*, the first appellations here given being merely local, the former signifying inhabitant of *Ra-khoing* country; the latter, or *Khyoung-tha*, being the name given to those who inhabit the banks of mountain streams within the same villages as the hill tribes, and support themselves by hill cultivation. How they came to be separated from their countrymen does not appear; it is rather extraordinary that they should remain so, as they subject themselves in the hills to great hardships, while to procure a subsistence in the plains is a matter of no difficulty. Lately I have seen some instances of their settling in the plains and cultivating land with ploughs. The religion of both these people is Buddhism; they may be said to belong to the Mongolian family, or to be between the Mongolian and Malay race; their written language is the same as the Burmese; in the colloquial there are some provincial differences.

The *Kolas*, or Moosulmans, are of an entirely different race to the preceding, they being of Bengalee descent. The *Arakan* kings in former times had possessions all along the coast as far as *Chittagong* and *Dacca*. Coins are still extant, struck by the viceroys at the former town, with Bengalee and Persian characters on one side, and Burmese on the reverse. While the Arakanese held these possessions in Bengal, they appear to have sent numbers of the inhabitants into *Arakan* as slaves, whence arose the present *Kola* (foreign) population of the country; they form about 15 per cent. of the whole population. The *Arakan* Moosulmauns preserve the language of their ancestors for colloquial purposes, but always use the Burmese in writing; they have also adopted the dress of the country, with the exception of the *goung-boung*, or head dress.

The third class in the plains are *Doms*. These form such a minute section of the population, that it is scarcely necessary to mention them. The *Doms*, it would appear, were brought from Bengal to be used as *Phrakywn*, or pagoda slaves. It is a strange anomaly in the Búdhist religion, (as it prevails in Burmah,) that the servitors of the temples are invariably outcasts, with whom the rest of the community will hold no intercourse. In Burmah Proper, pagoda slaves are pardoned convicts, or persons condemned to the employment on account of crimes. The kings of *Arakan* finding in Bengal a number of degraded

castes ready made to their hands, imported them and their families as perpetual and hereditary pagoda slaves. Their duties were to sweep in the vicinity of the temple, clear away the remains of offerings, whether of food, flowers, &c. and also to wash the idol. These people of course are now released from their compulsory servitude, and have become cultivators, but in consequence of their former condition, they are regarded by the people with as much disgust as they would be from their low caste, by Hindoos.*

Since the conquest of *Arakan* by the English, a large number of Bengalees have settled in the town of *Akyab* as shop-keepers, and in the vicinity as cultivators; these are not taken into account. In the interior reside a few Brahmins, some of Munnipooree descent, who were brought by the Burmese as astrologers, and some are descendants of colonists from Bengal, brought by the *Arakan* kings. I am inclined to think, that the Arakanese monarchs were in latter times very Brahminically inclined, and that the Burman conquest by infusing fresh Buddhist vigour, and contempt for *Kolas* generally, followed by our own occupation of the country, has prevented the introduction of Hinduism, which probably would have been brought about in the same manner as it was in *Muneepoor*. The hill people, the *Khyoung-thás*, have already been described; next come the *Kú-mí*, or *Kwe-mí*, tribe.

* The Arakanese have so far adopted the Hindu prejudice against them, that if any *Ra-khoing-thá* has unwittingly eaten with, or drank water from the utensil of a *Dom*, or other low caste Hindu, he is excluded from society until he has undergone certain purifications. Some years ago, when in consequence of inundations on the W. coast of the Bay of Bengal the population was reduced to great distress, a number of Ooryas found their way to this coast, and were purchased by Arakanese, or pledged themselves for service, they became inmates of families, and eat and drank with them; all at once it was noised abroad, that Ooryas were no better than Doms, than pagoda slaves. Numbers of respectable persons, men, women and children were forthwith declared unclean. They were excluded from the villages, the public festivals, and the *kyoungs*, or monestaries. To restore them was no easy matter. In former times the king had only to smoke a cigar after it had been used by an outcaste, and he was deemed restored forthwith; but now the royal line no longer existed in the country. At length it was settled that a meeting should be held of the most respectable men in the country, who agreed to smoke with the unclean; the pipe to be handed last to the European Magistrate, and then a general feast to conclude all. The ceremony was gone through with the half of numerous *Phoon-gyees*, (or priests), and much to the comfort of the outcasts, deemed and held to be sufficient for their restoration to society.

This hill tribe belongs to the same great family of the human race as the *Myam-má*; their languages being apparently of the same structure; their physiognomy alike; they have black strait hair, high cheek bones, oblique eyes, and scanty beards. The *Kúmís*, in short, appear like *Ra-khoing-thús* in a more rude state of existence; the traditions of the latter people refer to the former as already possessors of the country when the *Myam-má* race entered it. The *Kumís* chiefly inhabit the *Kola-dan* and its feeders. They are divided into several clans, which will be enumerated hereafter.

The next hill tribe is the *Khyeng*. There is comparatively a small number of this people within our border, that is to say, within the actual bounds of British authority in *Arakan*; only those who live on, and near to the banks of the *Lé-myo* river, are subject to our controul. Eastward of this river, up to the great *Yú-ma-toung* range, there are powerful tribes of this people, who rejoice in perfect freedom, (as long at least as they can defend themselves from the attacks of their neighbours.) They are separated from British authority by pathless mountains and forests, and being to the west of the *Yú-ma-toung* range, the Burmese have no dominion over them; many indeed to the eastward of those mountains are virtually independent of Burmah. The *Khyengs* live in the same primitive style as the *Kú-mís*, their manners and appearance being similar.*

The remaining hill tribes are the *Doing-núh* and the *Mrúng*. They both inhabit the upper course of the *Mayú* river. The language of the first is a corrupt Bengalee. They call themselves *Kheim-bá-nago*. Of their descent I could learn nothing; probably they may be the offspring of Bengalees carried into the hills as slaves, where their physical appearance has been modified by change of climate. In religion

* There is a class of people residing in the Chittagong district, who call themselves *Raj-bunsé*, and in Burmese *Myam-má-gyee*, or "great *Myam-mas*." They pretend to be descendants of the kings of *Arakan*, a flattering fiction which they have invented to gloss their spurious descent. They are doubtless the offspring of Bengalee women by *Myam-más*, when the latter possessed Chittagong, and other districts in Bengal. Their dress and language are Bengalee; but they profess the religion of their fathers, viz. Buddhism. These people are called *Mugs* in Bengal, and being well known in Calcutta as *Mug cooks*. I believe it is pretty generally supposed that the Arakanese are one and the same with them; a terrible insult to the Burma race! All Arakanese are termed *Mugs* by the people of India, from whom Europeans have borrowed the name. How it arose I cannot say.

they are Buddhists. The people called *Mrúng*, by the Arakanese, announce themselves as descendants of persons carried away from Tipperah several generations back by the *Arakan* kings. They were first planted on the *Lé-myo* river, with the view I suppose of cutting off their retreat to their own country; but when *Arakan* became convulsed in consequence of the invasion of the Burmese, they gradually commenced leaving the *Lé-myo*, and returning through the hills towards their own country. For a time they dwelt on the *Kola-dán*; now none are to be found in any part of *Arakan*, save on the *Mayú* in its upper course, and only a few stragglers there. Many still reside, I understand, in the hills on the E. frontier of the *Chittagong* district. By a reference to a few words of their language, given in the appendix, those acquainted with the language of the *Tipperah* tribes will be able to decide whether the tale the *Mrúngs* tell of their descent be true or not.

Having given an outline of the various tribes which now inhabit *Arakan Proper*, I proceed to offer some suggestions as to the original inhabitants. The traditions of the *Ra-khoing-thás* refer expressly to the hill tribes as being in possession of the country when their own ancestors entered it. The *Khyengs* have a tradition that they are direct descendants of some Burmese refugees, or the remnants of an army that was lost in the mountains when attempting to penetrate to the westward. From the *Kú-mís*, I could gather nothing as to their own origin, but I consider both tribes akin to the *Myam-má* race, and distinct from the Malay.* If it be true, as is asserted, that the immigration of the Malay race to Malacca, Quedah, and other districts from Sumatra is an occurrence comparatively of late date, then it is very improbable that they should have come so far north as 21° of latitude in a remote era. The *Khyengs* and *Kú-mís* are probably an offshoot of the *Myam-má* race, who left their original seat earlier than the immediate ancestors of the *Ra-khoing-thás*. The most southern *Kú-mí* tribes who inhabit the *Kola-dan*, represent themselves as being driven further south each succeeding year, in consequence of the encroachments of the fiercer tribes beyond them. These encroachments still proceed.

* To whom the hill tribes in this quarter have been assigned by Pemberton.

The *Ra-khoing-thas*, (whose national name, as before mentioned, is *Myam-ma*, whence the corruption *Bur-má*,) are so called as inhabitants of the country *Ra-khoing*, and this name is said to be derived from the Pali word *Rak-kha-pu-ra*, signifying “abode of demons,” which name may have been given to the country by the Bùdhist Missionaries from India. The classic name for the country, and that used in all state papers, is *Dha-gnya-wa-ti*.

The book which the learned refer to, as containing the whole account of their nation, is called *Ra-dza-wang*, or “History of Kings,” of which many copies exist, differing from each other in details of the early history, yet preserving alike the main features; there we are told that in *Oo-taya*, the northern division of the world, reigned the king *Ma-ha-tha-gya*, whose younger son, in consequence of a quarrel, was forced to fly his country. He came to the kingdom of *A-the-toing-dza-na*, (supposed to lie north from the city of Ava,) where he married the king’s daughter, and had by her ten sons and one daughter. These children departed to seek a home elsewhere; they came to the site of the present town, *Than-dwe*, (*Sandoway* as we usually write it,) which acquired its name from their binding it with an iron chain, so that the country no longer moved as was its wont; the germ of this account may possibly be the tradition of an earthquake or volcano in some remote period. The ten brothers and their sister now acquired the country. In various ways, eight of the brothers were killed, the remaining two brothers and their sister, who is named *Ang-dza-na-de-wí*, pursued their way northwards for *Arakan*. They were accompanied by a *Byam-ha*, which in Burman Budhist writings usually means I believe a celestial being, but here it is interpreted to mean a human Brahman or *Pun-na*;—whence he sprung does not appear. On the road the two remaining brothers were killed, one by a *Bhi-lú*, or human flesh-devouring monster, the other accidentally by a hunter’s arrow, discharged at a deer. The *Pun-na* and the lady proceeded alone; on their arrival in *Arakan*, they find the male line of the royal family is extinct. So confused is the account, that *Arakan*, which before was represented as one vast forest inhabited only by *Bhi-lus*, is here said to have a large population, and a queen over it. The *Pun-na* forthwith marries the daughter of the last king, and their progeny fill the throne for several generations. The sister

of the ten brothers becomes the second, or inferior wife of the *Pun-na*. Why this long story of the ten brothers and their sister was given does not appear; they are not of any importance to the after-history, for according to it none of their descendants fill the throne, or exercise any authority; but in this account we may recognize the first entrance of the *Myam-ma* race into *Arakan*, which we may infer, by the story of the town of *Than-dwe*, took place rather by the delta of the *Arawati*, where communication is easy, than by the mountain passes farther north.* Yet the *Ra-khoing-thas* of the present day believe themselves to be descendents from a western people. They confound those who were their religious instructors with their progenitors, and fancy themselves of the same stock as the Hindus. The above abstract of their history contains evident marks of a mixture of genuine national tradition, and the invention of later times, when they had been taught the use of letters, and had been instructed in religion by Buddhist Missionaries from India.

To proceed with the historical abstract, the descendants of the *Pun-na* long governed the country,† but supernatural monsters again prevailed, and the whole population was destroyed. All these events occurred after the manifestation of the Boodh *Ka-tha-ba*, and before the advent of the Boodh of the present period, *Gau-ta-ma*. As this latter person is supposed to have lived B. C. 543, the *Arakan* annals vie with those of India in antiquity!

Arakan then was again made desolate by *Bhi-lus*; at this time *Ang-dza-ná*, the son of the king of *Kapi-la-wot*, (or *Ma-ga-dha*,) having left his country and wandered through forests and mountains, arrived at the source of the river *Kola-dan*; there he had intercourse with a doe, which big with young, was carried down the stream in a flood, and cast ashore at the mouth of the *Mee-khyoung*, a mountain stream which joins the *Kola-dan* from the eastward; there the doe brought forth a son. A hill chief, of the *Toung-mru* tribe, was out hunting, when his dog pursuing the scent of the doe led him to the spot where she lay, and he saw the body of a beautiful child "shining,"

* I refer here to the entrance of the people who now inhabit the plains, not to that of the hill tribes, who though I suppose them to be of the same stock, had come much earlier, and were more rude than the new comers.

† Cities on the east, and ninety-nine on the west of the *Ga-tsha-bha* river are said to have flourished.

as the history has it, in the midst of a bush ; the doe started off, and the hill chief taking up the infant conveyed him home. The child when grown up, marries the chief's daughter ; but not from this union was the royal race of *Arakan* destined to spring. The doe-born youth is named *Ma-ra-ya* ; he becomes the favourite of the *Nats*, who furnish him with magic weapons, and he clears the country of the monsters who ravaged it. By some strange accident, which is not explained, a princess of the *Pun-na* dynasty has been preserved amidst the general ruin ; she is discovered by the doe-born son of *Ang-dza-na*, and they are married. The country once more becomes populated, and the city of *Dha-gnya-wa-tí* is built to the north of the present city of *Arakan*.

Of this race fifty-five kings reigned throughout a period of 1800 years ; another dynasty then succeeded, which numbered twenty-four kings, whose reigns extended throughout a period of 835 years. Then came the king *Tsan-da-thoo-vee-yá*, who was not of a different dynasty, but in his reign the Boodh *Gau-ta-ma*, having been born in *Ma-gadha*, visited *Arakan* ; the pious king in honour of him built the famous temple of *Ma-ha-mu-ni*, which still exists ; before *Gau-ta-ma* left *Arakan*, the king caused a brazen image of him to be cast ; or rather it was miraculously formed by the *Nats*, being a likeness of the Budh when living, and being for ages after endowed with the faculty of speech, it became celebrated in all Buddhist countries. This image was carried away by the Burmese after their conquest of the country in A. D. 1784, and is still to be seen in *Amerapoorá*, where it is regarded with peculiar devotion.*

The successors of *Tsan-da-thoo-wee-ya* are recorded in regular succession, though the dynasties are frequently changed. One hundred and thirty-five kings extend from *Tsan-da-thoo-vee-ya* to the last king, *Ma-ha-tha-ma-ta*, who reigned when the country was conquered by the Burmese. The *Arakan* kings in the interim, "if they have writ their annals true," carried their victorious arms into the valley of the *Ari-wa-ti*, to Siam, and even to China. The present *Arakan*

* Before their conversion to Buddhism, the *Myam-mas* had probably the same simple religious rites which we see among the hill tribes to this day, *i. e.* occasional offerings of food, flowers, &c. to the *Nats* or Spirits, placed in the open air. Indeed these offerings are still common throughout Burma, though they are disallowed by strict Buddhists.

era corresponds with A. D. 639; from what event it was established is not mentioned, but I have been told that the former era having extended to many hundred thousand years, had become inconvenient for ordinary purposes, and therefore a new one was commenced.

The first king whose reign is calculated in the *Ra-dza-wang*, according to that era, is *Meng-Tsan-mwon*, who ascended the throne in 746, equivalent to A. D. 1385; before his time the number of years each king reigned is entered, but not the year of his ascent according to the era, though of course this is easily ascertained. His grand nephew, *Ta-tsan-phyoo*, who succeeded in 821, or A. D. 1460, had extensive possessions in Bengal. Coins of that date now exist with legends in the Bengalee and Persian character, as well as Burmese, some being struck by the viceroys in Chittagong, others in the name of the king himself. About a century later, the Portuguese appeared and attempted to conquer *Arakan*. I say the Portuguese, though the natives now call them *Angleit*, and I believe them to be no others than the English. But *Ang-leit* is, I think, an interpolation of the copyists of the *Ra-dza-wang* in later times; the invaders are first called *Bho-dau-thwe-pha-laung*, the first word being apparently a corruption of Portuguese, and the second a term of contempt towards foreigners, *pha-laung* being a provincial word for a tadpole. In the latest editions of the history, the white invaders in ships are called *Bho-dau-thwe-aung-leit-pha-laung*—i. e. Portuguese-English tadpoles.* The invasion by the Portuguese occurred in the reign of *Meng-bha*, and the same year a son being born to him, was known afterwards by the name of *Meng-pha-laung*. This king in A. D. 1610, (vide Marshman's *History of Bengal*,) joined with some Portuguese adventurers in invading Bengal, when they took Bulooa and Luckipoor. This event is also recorded in the *Ra-dza-wang*. In A. D. 1666, we learn from the *History of Bengal*, that Chittagong was lost to the Arakanese, they being defeated on the banks of the Tenny river by the Subadar of Bengal. After this defeat, the Arakanese were occupied with feuds at home; the old race of kings was deposed in 1124, or A. D. 1763, and different chiefs, one after another, took possession

* This term *pha-laung* is still frequently screamed after Europeans by children in the streets of *Akyab*, the little rogues then run off laughing heartily.

of the throne. At length the Burmese, on the invitation of *Than-dau-we*, who was the *Myo-thoo-ggee*, or head fiscal officer, invaded and conquered the country. The reigning king at that period was *Ma-ha-tha-ma-ta*, and his son *Re-bhau* is still living in *Amerapoor*.

In various parts of *Arakan* there are traces of a much more extensive population than it contains at present. The ruins of the ancient temple of *Maha-muni*, built entirely of stone, the sites of former cities shewn by the remains of tanks and ruined pagodas, the extensive stone walls at the old capital, certainly tell of a more flourishing kingdom than what the British found it; but we have no satisfactory evidence of the *Arakan* kings having subjugated Burmah and Siam, much less China! Of the conquest of a part of Bengal, we have credible historical evidence. At Dacca, I believe are still to be found the remains of a Bhudhist *dze-di*, or pagoda, which can only be attributed to the conquering Arakanese. The name *Tset-ta-goung*, of which Chittagong is a corruption, is Burmese, and the descendants of people of Tipperah brought hence from that country, still survive. There are also some villages of Shan descent, but those people were most probably brought from the Shan population, which is to be found located west of the river *Ara-wa-ti*.

The Burmese established their head-quarters at the old capital. For a few years their government was undisturbed, but at length rebellions were stirred up by an individual called by the English *King-berring*,* who was the son of *Than-dau-we*, the *Myo-thoo-gyee*, who had first invited the Burmese into the country. Many of the Arakanese fled into the neighbouring British province of Chittagong, and thus quarrels arose on the frontier. At length the Burmese having provoked the British government by several acts of aggression, *Arakan* was invaded by the English, who accompanied by a number of the former inhabitants, conquered it with ease, and entered the capital May 1825, since which period it has been annexed to the British Indian empire.

Arakan is divided into 160 circles, of which 148 are denominated *kywn*, or islands, being situated in the low lands, and 12 are called *khyoung*, or stream, being in the hill districts. They contain a total of

* Properly *Khyeng-byan*, lit. "*Khyeng-return*," so called because he was the first-born after his father returned from the *Khyeng* hills. A son of *Khyeng-byan* died in *Akyab*, A. D. 1840.

960 villages. Each of these circles is placed under an officer, designated *kywn-aop*,* or *khyoung-aop*, according to the locality of his charge. The duties of a *kywn-aop* are to collect the revenue, to preserve order in his circle, and to assist the police in the apprehension of criminals; through him are made all statistical inquiries, and to him are referred many disputes concerning land; he is paid 15 per cent. upon his collections. In each circle there are from 3 or 4 to 15 or 20 villages; the revenue collected by the different *kywn-aops* varies from 200 to 10,000 rupees: this great difference results from the rapid increase within a few years of some circles, compared with others, consequent on superior fertility of soil, more convenient locality for exporting grain, and other causes.

The office of *kywn-aop* is not hereditary, but the son of any man who has rendered essential services, generally succeeds on his father's demise.

Next to the *kywn-aop* is the *rawa-goung*, or village head. This officer is elected by the villagers themselves; if there are two or more candidates for the appointment, the villagers meet and sign their names to a document containing the name of him they vote for; these lists are then forwarded by the *kywn-aop* to the officer in charge of the district, (called *myo-woon*,) who appoints him that has the majority of votes, unless indeed there be some good reason for rejecting him. The people generally make a good choice; for the last three and half years I do not recollect more than one instance of such an election being disapproved. The *rawa-goung* collects the revenue of his village, and delivers it to the *kywn-aop*, who carries it to the government treasury. He is paid four per cent. on his collections. A village of thirty houses is entitled to a *rawa-goung*, that is, to a stipendiary one; if a village have a less than that number of houses, they pay their tax to a neighbouring *goung*, but if the villagers, as frequently happens, dislike this arrangement, and elect a *goung* of their own, the proceeding is confirmed, but they must pay him themselves. Their object then is to induce settlers to come among them, whereby their village may be raised to the privileged standard of thirty houses.

Under the orders of the *rawa-goung* is the *rawa-tsa-re rawa-tsa-gan*, or village scribe. He is paid two per cent. on the village

* This is pronounced as one syllable, *Kyok*.

collections. The appointment is usually held by the son or some relation of the *rawa-goung*. His duties are to prepare, under the orders of the *goung*, the village *sa-rang* or register, containing the name of each householder in the village, with the amount of tax demandable from him upon each item.

There are no agents of police in the villages; the village officers being held responsible for the preservation of order and the seizure of criminals.

Throughout the district there are six police stations, (*thanahs*), at which the police ordinarily remain, until information being given by a village officer or other person, of any occurrence requiring their presence, they proceed to the spot. Nearly all communication in the district is carried on by water.

The European functionary in charge of the district is styled a Senior Assistant to the Commissioner of *Arakan*, (by the people *myo-woon*.) His duties are of the same nature as those of a Magistrate and Collector in India; he also tries civil suits, and hears appeals from the native Judge's court. There is also a Junior Assistant to the Commissioner. To conduct all revenue affairs, there is an officer styled *myo-thoo-gyee*, whose office under the Arakan and Burman governments was considered the most important in the country; he then apportioned to each circle the amount of revenue demanded by the government; his duty now is under the orders of the Senior Assistant, to superintend all the *kywn-aops*, and to inspect and report on the annual registers of their circles; the office still carries with it a great deal of importance in the minds of the people. This officer is paid a fixed salary, and resides at the chief town of the district. The revenue business is conducted solely by natives of the country, and the language of the records is Burmese. The judicial officers of the Magistrate's court are Bengalees, chiefly natives of Chittagong, it not having yet been found practicable to introduce the *Arakanese* into this branch of the public service. They are however active and energetic police darogahs.

There is a native civil judge styled *ta-ra-ma-thoo-gyee*, who tries all suits for sums not exceeding 500 rupees. Few cases in *Arakan* are for a larger amount than this. The language of the Civil Judge's court is Burmese. He holds his court at *Akyab*.

The chief town of *Arakan* now, is *Akyab*; it is situated at the S. W. extremity of the district; it was first occupied in the beginning of 1826, and consisted only of a few fishermen's huts called *Tset-twe*, the name by which the present town is still known to the natives. The old capital, which lies about 50 miles distant N. E. from *Akyab*, was abandoned on account of its unhealthiness. The site of *Akyab* was well chosen. It is at the mouth of the principal river of the country, the natural outlet for the produce of a vast extent of fertile land; the soil in the immediate vicinity is of a light sandy nature, unlike that of the interior, which is generally clayey; both the traditions of the people, the appearance of the surface, and the marine remains, proclaim the site to have been but lately redeemed from the sea. Shells are to be found near the surface in the streets of the town, and on the roads of the station; west of the station is to be traced a raised sea-beach, along which a road now runs towards the river *Ma-yu*, and between it and the present sea stretches a plain of more than a mile in extent; here tradition also points out where ships used formerly to be moored.* To the S. W. of the station is a ridge of sandstone rocks running nearly N. and S. some distance inland, and elevated in some places from 25 to 30 feet above the highest tides; to this height the rocks are perforated by marine animals. There is no tradition regarding any convulsion having raised this tract of country. The same effects are visible along the coast for 50 or 60 miles from *Akyab*. In the upper portion of the ridge of rocks above mentioned, no shells are to be found in the perforations, but lower down oyster-shells are still seen adhering to the rock. On the opposite shore of the *Akyab* harbour is a remarkable conical-shaped rock on the top of a little hill elevated above the water about 150 feet. It is stated, that in the reign of king *Thoo-re-ya-tseit-ra*, the water was so high, that this conical rock was only just protruded above the surface, and the king on the occasion of a war-like expedition, deposited there his hair comb as an offering, without moving from his boat; hence the rock is called to this day, *Oo-bee-gyap-toung*, "Head-

* *Akyab*, the name given to the present town by foreigners, is perhaps derived from the name of a pagoda built hereabouts, which was probably a good land-mark in former times, and therefore well known to mariners. The site of the pagoda is called *A-khyat-dau-kun*, "Royal-jaw-bone hillock," from a jaw-bone of *Gautama's* being buried there.

comb placing hill." *Akyab* is a very regularly built town ; the streets are broad, and all run at right angles to each other ; the houses are of flimsy materials, being built only of bamboo and canes of the *nipah* tree, but they are spacious and airy, and being elevated a few feet above the ground, are admirably adapted to the damp climate of *Arakan*. The population of *Akyab* does not exceed 5,000 souls, excluding some villages which form the suburbs.

The whole of the land of *Arakan*, whether forest, cultivated or fallow, is the property of the state ; but as it seldom happens that the state has cause to assert its claim, the great mass of land is transferred by sale from hand to hand, or inherited from generation to generation, like other property. Every man who purposes bringing waste land into cultivation, gives notice of his intention to the *rawa-goung* ; either that officer, or the cultivator himself if he pleases, informs the officer in charge of the district, and the land tax is remitted for two or more years, according to the nature of the soil, and the jungle to be cleared. Cultivation and occupation of land give a prescriptive right to a cultivator as long as he pays the Government demand upon it, but if he abandon it without entering into an arrangement with any body else to keep it in cultivation, or to pay the Government demand, he forfeits his right to it. The cultivator then has the possession, but not the property of the soil. By custom a distinction is made between rice land, and that which has been enclosed for gardens. If a portion of the former be taken for public purposes, a road for instance, the common law of the country gives the cultivator compensation ; but in the case of gardens, the owner is entitled to the value of every tree and shrub they contain ; all produce being *bona fide* his private property. Some cultivators make over their land to others for a year or more, if from any cause they are unable to cultivate themselves ; if their land be very productive, or have any peculiar advantages of position, they receive a rent for it from the sub-tenant which frequently equals the Government demand ; these arrangements among the people are not interfered with ; the former tenant's name remains in the village register, and he is responsible for the Government tax, unless he has formally given notice to the *rawa-goung*, that he is not going to cultivate. On the death of a cultivator, his land is inherited by his heirs in like manner as if it were

his own property ; the law of the people, whether Burman or Mahomedan, regulates the proportion which the heirs receive.

The mode of " settlement " of a village in *Arakan* is as follows :— During the month of February, by which time the crop is cut, and the grain for the most part thrashed out and winnowed, the *ra-wa-goung* gives notice to the cultivators that he is about to measure their lands ; he is accompanied by the village scribe, and the cultivators of the fields in the direction of which he is proceeding ; sometimes the *kywn-aop* is present, but not always ; in extensive circles he cannot personally superintend the measurements in all the villages.* The cultivator whose field is to be measured holds the bamboo, which is 12 feet long, and measures out the length and breadth of his field, which is then written down by the village *tsa-re*, hence the area is deduced and the village register prepared. Thus the *ra-wa-goung* goes through all the lands of the village. In the register is entered the name of each householder, his wife's name, (but the women are not so carefully registered as the men,) each lodger, and formerly every bachelor above the age of 18 years, together with the amount of tax due from them, whether for rice land, garden land, or capitation tax. To make a return of those persons subject to capitation tax, the *ra-wa-goung* must be acquainted with the age and condition of each villager, whether married or unmarried, a householder or lodger. This tax formerly extended to all males above the age of 18, who were deemed capable of manual labour ; but within the last year (1840,) this objectionable tax has been much reduced, unmarried youths wholly exempted from it, and the train laid for its eventual abolition.†

The village register being framed is delivered to the *kywn-aop*, who has received like registers from each village in his circle, and he delivers them into the *yon-dau*, (kucheree,) where they are compared with those of the past year ; if no doubts arise as to their

* The land measure now in use in *Arakan* was introduced from *Chittagong* in 1835. Up to that period the tax was levied not upon the area of cultivation, but upon the ploughs, each plough being estimated as equal to a *doon* of land. A *doon* contains 30,720 square yards, equal to a little more than six and a quarter English acres.

† A poll tax is not necessarily of that hateful nature generally ascribed to it, and certainly it is not so regarded in *Arakan*. We have an instance of a self-governed people voluntarily imposing this tax upon themselves. " In the state of Massachusetts, every male citizen, from 16 to 60, is subject to a poll tax, which is commonly a dollar, or a dollar and a half."—*Goodrich's Universal Geography*, Boston edit. p. 340.

accuracy, they are accepted ; if they appear incorrect, inquiries must be instituted through other channels than the village officers. Supposing them to be accepted, the *kywn-aop* then receives slips of paper, called *kyoung-hlya*, which are bills presentable to each tax-payer for the amount demanded from him, with a specification of the item of taxation for which the demand is made, whether for rice-land, garden-land, capitation, or the extent of his land by measurement, and the months in which each instalment is to be paid. No man can be called on to pay any tax without a bill for the amount, bearing the seals of the *myo-woon* and *myo-thoo-gyee* being presented to him ; the village officer must give a receipt on the back of the bill for each instalment paid. If a tenant be dissatisfied with the measurement of his land, and dispute the amount demanded in the bill, either a new measurement by the village officers is ordered, or, at the request of the tenant, a person unconnected with them is sent to remeasure the land ; the expence of this new measurement falls on the village officer if his outturn be found incorrect, or the cultivator if it be correct. The above process of registry and land measurement is continued yearly. It is not to be supposed that from so rude a people really correct survey of the cultivated area is to be obtained ; all that can be hoped for, is to procure a fair approximation to the actual amount.

The cultivated rice lands are divided into three classes, which pay at the rate of 12, 10, and 8 rupees per *doon*. The first sort will produce from one thousand to twelve hundred baskets of *dhan*,* which will sell on the average at from 10 to 12 rupees per 100 baskets. One man with a pair of buffaloes will cultivate a *doon* of land with ease ; the produce will fetch, in ordinary seasons, from 100 to 120 rupees ; the tax payable to Government therefore for this class of land is from 10 to 12 per cent. of the gross produce of the soil ; the profit from the second and the third class of lands is from 1 to 2 per cent. less than the above ; the cultivator thus realizes a handsome profit, and is certainly never distressed to make payment. I have never known a single cultivator a defaulter. The grain market has hitherto been a sure one ; the cultivator receives for his grain cash payment from the ship, which

* The basket of *Arakan* proper is much smaller than that of the Southern districts ; 100 of rice of the former are equal to about 30 Indian maunds.

anchors alongside the field that has grown the rice. It is principally exported to Madras, Coringa, and Masulipatam. A reference to table B will shew the rapid increase of the *Akyab* rice trade; we there see a population of less than 1,50,000 souls, growing and exporting grain to the value of eleven and a half lakhs of rupees. Only one rice crop is raised in the year. The tax on gardens is higher than that on rice land, being at the rate of 16 rupees per *doon*.

Wages in *Arakan*, compared with those of Bengal, are very high. For ordinary labour the people of the country cannot be hired at a less rate than four annas a-day, or if by the month, six rupees; though for some sorts of work they demand seven to eight rupees a month. In the reaping season, which generally commences in December, many hundreds, indeed thousands of coolies come from the Chittagong district by land and by sea, to seek labour and high wages. They are engaged by the Arakanese cultivators, and are generally paid at a certain rate for the quantity of rice cut down. If they work diligently, I am informed they can earn from four to five annas per diem; in their own country their labour for the same time would not bring them more than six pice, or at the most two annas. The Bengalee labourers are not much employed in ploughing the land; that work is performed in the rainy season (about the middle of June) at the commencement of which they for the most part return to their homes. They are beginning however to seek employment also in ploughing land. One great source of loss to the cultivators, is the frequent occurrence of a murrain among their cattle, by which thousands sometimes perish in a single year. In 1839-40 a sickness prevailed among the cattle, simultaneously with the *cholera* among the inhabitants, by which 16,000 head, cows and buffaloes, were carried off. The cattle are replaced from *Chittagong* and also from Ava. I have been much interested at witnessing the cheerfulness and determination with which a cultivator would set to work at his field by spade, after losing his buffaloes, worth perhaps from 40 to 50 rupees the pair, determined to labour hard in order to replace them as soon as possible.

A measure has lately been sanctioned by government for the whole province of *Arakan*, which is calculated to extend largely the cultivation of jungle tracts, and perhaps eventually alter the tenure of all land in the country. Rules have been passed for grants of large

areas, and they are so liberal in their terms, that they cannot fail to be successful. They confer leases in the first instance for periods varying from eight to sixty-four years, according to the nature of the land ; rent free for half the period of the lease, and at a low rate of rent for the remainder. The hereditary right to the soil is declared as long as the grantee fulfils the terms specified ; future leases for twenty years are guaranteed at a no higher rate than the average of that paid by adjoining government lands. The people do not yet sufficiently appreciate the advantages to be eventually derived from these grants, but they are gradually becoming more sensible of their value. Numbers of the descendants of those who fled in troublous times from their country, and settled in the southern parts of Chittagong, the islands of the coast, and even the Sunderbuns of Bengal, are gradually returning. Rumours of an attack from the Burmese have prevailed among them for the last three years, and retarded their return, but this alarm has now subsided, and during the N. E. monsoon, boats filled with men, women, and children, with all their worldly goods, may be seen steering south along the eastern coast of the Bay of Bengal, to return to the land their fathers abandoned 30 or 40 years before. They have told me, that in their exile the old men used to speak with regret for its loss of the beauty of their country ; the fertility of the land, which returned a hundred-fold ; the heavy ears of rice ; the glory of their ancient kings ; the former splendour of the capital ; the pagodas, and the famous image of *Gautama* now carried away, with which the fortunes of the country were indissolubly united. Who would have imagined that *Arakan* could inspire such sentiments !

It is a question of interest to consider how far the people of *Arakan* are satisfied with British rule. The mass of them are infinitely better off now as regards personal freedom, wants, and comforts, than they were under the government of their native princes or the Burmese, and they are doubtless sensible of the advantages they now enjoy. During the times of the *Arakan* kings, and the Burman governors, the people were not called upon to pay much in regular taxes, but there were constant calls on them for labour, for service, and for materials to make or repair the houses of the *kywn-aops* and other government officers ; besides which, the circles were obliged to furnish the public officers with followers for special duties ; the people therefore

had no certainty of the amount that would be demanded from them. *Arakan Proper*, after paying its own expences, or satisfying its local government, was required to furnish subsistence for the royal white elephant; this amounted to 120 viss of silver annually, or about Company's rupees 20,000. All the lands west of the river *Mayu* were set apart for the Tharawadi Prince, the present king of Ava. He appointed to them an officer, who remitted to Ava yearly the tribute due to the prince, which amounted to about 3000 rupees. Neither the *myo-woon*, nor any of the public officers received any fixed salary, but had fees upon all collections and customs, and a share of all fines imposed. Each buffaloe plough paid yearly 15 Burman baskets of *dhan*, equal to $10\frac{1}{2}$ maunds. Each bullock plough paid ten Burman baskets. There was also a capitation tax on each married householder. When the *myo-thoo-gyee*, and other officer was called to the court of Ava, the province had to pay the expences of his journey, as also of the journies of the *myo-woon*, and other officers appointed from Ava, on their coming to assume charge, likewise on their recal. A certain number of men were expected to take to Ava every year a beautiful flower peculiar to *Arakan*, which none but the royal family were allowed without permission to wear in their ears or hair; others were set apart for keeping the royal gardens in order; sixty were always to be at work at Ava, and had to be supported by the remainder of their number in *Arakan*; they were relieved annually.

These various calls upon their industry, the general poverty from stagnation of trade, and the flight of a large portion of the populace, together with nearly all the respectable families, made the condition of the people very wretched, and the contrast is infinitely in favour of the present state of things. But the upper classes do not participate in these congratulatory feelings to the extent that the lower do. They have regained their country, but not the high position they appear to have anticipated. They refer to the power they formerly had under their own kings; their being then allowed to hold slaves, who under our rule have been declared free; also the emancipation of the debtor slaves, who having pledged their persons were bondsmen to their masters, until they could repay the sums advanced.

The upper classes, and the literati, who are much respected, speak with regret of the neglect now shewn to pagodas and religious edifices,

which formerly were repaired by the government ; they declare there is a general decay of *dhamma-wat*, or virtue, among all classes ; less attention to religious duties and ceremonies, which they attribute to the governing power not setting the example ; to this neglect also is attributed cholera and sickness among cattle, which of late, have frequently visited the country. The *phoongyees*, or priests, complain, that people are no longer constrained to respect in their presence the law, “thou shalt not kill,” but catch fish in tanks near the monasteries with impunity.

When *Khyeng-byan* raised a revolt against the Burmese, (he was the son of the man who first invited them across,) all the most respectable families joined his standard, and finally they fled to the Chittagong district. These men on the breaking out of war between the Burmese and the British, offered their services, through Mr. T. C. Robertson, then Magistrate of Chittagong, to assist in conquering *Arakan*. Some of them were connections of *Khyeng-byan*, and relations of those chiefs who, in the latter times of the kingdom when the regular monarchs were deposed, had one after another seized the throne. Among these men, two of the most distinguished were *Oung-gyau-ri* and *Oung-gyau-stan*, the former a brother-in-law of *Khyeng-byan*'s, rendered important services to the army of invasion ; the latter was a nephew of *Khyeng-byan*'s, and a man of influence and ability. After the occupation of the country, these men were amply provided for, but appear to have cherished hopes that when the British army was withdrawn, the country would be made over to them, or at least to a native dynasty. Both were impatient of controul, and were convicted of exercising their authority with cruelty. One was removed from his office of *myo-thoo-gyee* on a charge of bribery and corruption, and the other being convicted of severely wounding a police darogah with a *dha*, was sentenced to seven years' imprisonment.

In less than two years after the occupation of *Arakan*, the establishment of a native dynasty was canvassed and plotted for, and these two men, together with nearly all the influential persons in the country, were privy to intrigues to compass that object. In December 1826, or January 1827, a grandson of *A-bha-ya*, a chief who had seized the throne and reigned for nine years before the Burman conquest, returned to *Arakan*. His father, named *Pa-tang-tsa*, had been carried to Ava

by the Burmese. The son of *Pa-tang-tsa*, named *Shwe-pang*, either had made his escape, as he averred, or been permitted quietly to depart the court of Ava, perhaps, hoping thereby to excite troubles in *Arakan*. Certain it is, that on his appearance, most of the headmen of the country were favourable to his claims, and attempts were made in April 1827, to tamper with the native officers and men of the Local Battalion. *Shwe-pang* was subsequently made a *kywn-aop*; the flame was smothered for a time, but the fire remained smouldering. Nine years after, the above named individuals were guilty of exciting a man, named *Kyeet-tsan-we*, to rise in arms; he commenced plundering the country, with the assistance of a band of escaped convicts, and other desperate characters, and some of the ignorant hill tribe, the *Khyengs*. He and his adherents were at length forced to fly into the Burman territory, whence they were brought back in the beginning of 1837, being given up by the Burman government.

This *emeute* was called *dakoity*, (gang robbery,) but the real object of the attempt was to seize the government of the country. The instigators were insane enough to believe, that the British government would be wearied out by their system of ravaging the country, and make it over to them on payment of a yearly tribute! Since this attempt, every thing has been very quiet. The English expedition to China has excited an intense interest among the *Ra-khoing-thas*, and as China is regarded as the first power in the world, the issue of the contest was held to be rather doubtful until the favourable result of certain magical calculations which were resorted to, when it was discovered to have been long ago foretold in certain books, that the English were destined to subdue China. There is in *Arakan* a village named *Ta-rouk*, the same name which the Burmese give to China. On going into the interior in January 1841, I directed my steps to this village first, in order to ascend a hill in the vicinity. The people were impressed with the belief that I was going there to have a mimic fight for the village, and order the inhabitants to come out and make their submission, as an omen for the success of the China expedition!

Within the last four years, great improvements have been made in *Arakan* taxes. It is difficult to account for such an impolitic and unjust system of taxation as existed up to 1836 ever having been proposed or adopted. Boats, nets of all sizes, cattle not used in agri-

culture : all trades, occupations, and callings had separate taxes upon them ; these have now been happily abandoned, and other taxes to the amount of nearly a lakh of rupees reduced, without any loss accruing to the state. The grants of land will raise up a new class in *Arakan*, viz. of extensive landholders with an hereditary right to their estates, whose interests will be bound to the British government.

Among the hill tribes I have omitted mentioning two, viz. *Kyan*, and the *Toung-mru*, of which only a few families exist. The former live on the *Kola-dan* among the *Ku-mis*, from whom they differ in some habits, but have the same general appearance. A few words of their language will be found in Appendix D. A few houses of the *Toung-mru* tribe are to be found in the upper course of the *Ma-yu*.

The hill tribes within the British territory, may as regards their relation with the government, be divided into two classes.

1st. Those who live near the plains, and are therefore entirely under the controul of the *Arakan* authorities.

2d. Those residing at a greater distance, and whose country is inaccessible for ordinary purposes.

The first are assessed at the rate of two rupees per annum for each cultivator ; the chiefs are answerable for the preservation of order in their clans, and must surrender all criminals to be tried by law. Slaves among these tribes have been emancipated.*

Among the second class, no inquiries are made regarding the number of cultivators, but the chief of the clan pays a fixed sum yearly in token of his fealty. The tribes of this class are not interfered with in their internal arrangements, but of course they are bound to abstain from all attacks on tribes within the British frontier, and indeed beyond it ; too frequently it is to be feared they join in the former, or furnish information which leads to them. They still hold slaves, and punish their own criminals in petty cases. It would be

* The chiefs complain of this as a great hardship. In a *Khyeng* tribe, I once met a young *toung-meng*, or chief, who had lost one of his fingers. It appeared that his slaves had one fine morning absconded, and he was obliged to set to work himself for his support in clearing forest land. By his clumsiness, he soon cut off a finger, and now he held up his mutilated hand to me, in dumb appeal for the restitution of his slaves. This young man was all but naked, and a blush was visible in his clear olive cheek, when the *Ra-khoing-thas* with me threw a cloth over him, and he heard for the first time in his life, that he was committing a breach of decency in appearing unclothed.

next to impossible to controul them on these points, as they are separated from the plains by too difficult and dangerous a country to be approached, except by an armed party. The hill tribes pay their quotas in cotton, ivory, and other raw produce. Tribute is paid by all tribes residing within the limits, in which the *Arakan* and Burman governments formerly exercised authority. Some of these know us by name as some dreadful beings, but have never beheld an European.

The hill tribes live a life of danger, struggle, and hardship. The chiefs indeed have an easy time of it, but the women are especially hard worked. The latter are scantily clothed, as much so, however, as precipitous hills and a warm climate render necessary; they are stoutly made, but diminutive in size; the generality not exceeding in height four feet six inches. The *Ku-mis* (men) are not smaller in stature than the Burmese, the *Khyengs* I think are.

The hill cultivation is called in Burmese *toung-ya*. It consists in clearing away the thick forest, and luxuriant shrubs and creepers, which clothe the mountain sides. After the large trees are cut down, what remains of the underwood is set on fire; the stumps of the large trees are left standing. This work is finished in April. The seed, whether rice or cotton, is then put into the ground, small holes being dug or scraped a few inches apart, with a sort of hand hoe. The crop is reaped in October.* What a hard and bitter life must these people live! Each year the same labour must be encountered, the same dense unyielding forest be cleared, and yet they know not whether they shall be there to reap the fruits of their toil, or be carried off in an attack as slaves to some more powerful tribe. Notwithstanding the noble trees which find sustenance upon the mountains, yet the soil is so unfavourable to grain, that it cannot be raised again, the people say, upon the same spot in less than from fifteen to twenty years. I am inclined to think, that this is chiefly in consequence of the rich surface soil, when deprived of its protecting trees and shrubs being washed down the steep hill sides by the heavy rains; it is not until brushwood has again appeared, and the soil been bound again by bamboo roots,

* Besides grain and cotton, the hill tribes grow tobacco and a few esculent vegetables, such as pumpkins, gourds, &c. These are planted in little valleys, or by the side of streams, on soil left dry after the rainy season.

(which spring up very thickly in two or three years after a hill side has been cleared,) that sufficient soil is accumulated to nourish grain. Each returning season, then, brings for these mountaineers the toil and hardship of a new clearing. They are unacquainted with the terrace cultivation of other hill countries; indeed the hills appear too precipitous for it to be practicable. Spots favourable for clearings are by no means plentiful. The people have sometimes to go one, two, or more days' journey from their village, in small parties here and there, to sow their grain. In these separate clearings, they erect temporary sheds, raised from fifteen to twenty feet from the ground, and remain there until the work is finished, when they return to the village, leaving perhaps two or three hands to watch the crop. These people instead of the high raised sheds commonly used, sometimes sleep at night up in trees, where they have made a convenient resting place with interwoven branches, and a few split bamboos bound together with strong creepers, which interlace these forests in profusion. This practice has perhaps given rise to the tale, that some hill tribes had no regular dwellings, but lived in trees, more like apes than men.*

After a village has remained in one site for two or three years, all the culturable spots in the vicinity are cleared and exhausted.† The

* The tree-living *Kukis*, represented to live in the hills and forests east of the *Chittagong* district, have attracted considerable attention. The whole account of their cannibalism and tree-dwelling I regard as fable. There may perhaps have been instances of some of these savage tribes offering human sacrifices. I have had intercourse with very "pretty savages" in the wild country bordering on *Arakan* to the E. and N. E.; all of whom had comfortable houses, even the poorest of them far more roomy than the wretched hovels of Bengalee peasants; these savages had intercourse with other tribes beyond them, but had never heard of tree-living and human-flesh-devouring people, though they had plenty of wonderful stories to tell of Amazonian tribes, where male children were destroyed, and of others who by magic could make themselves invulnerable. But these best authority is that of the *Khyoung-thas*, men of Burman race, who live among the hill tribes, and are comparatively civilized. Some of these I have known who had been taken as slaves, and passed to distant independent tribes, and subsequently regained their freedom. These men had never heard of tree-living men. The name *Kuki* was unknown to all, but the same tribes are called by many names. The tale has, I suspect, been received from Bengalee narrators in the *Chittagong* district, and incautiously received as correct. What European can vouch for its truth?

† I know two cases, one beyond the British territory, where tribes had a wide range of territory, and jealously guarded against any clearing being made in it by other tribes. They have thus kept their villages on the same site for more than twenty years, or crops, for so they reckon time. One of these villages was perched upon a rock almost inaccessible, it was therefore a favourite position, one not easily surprised.

people must then look out for another home ; their village is abandoned, and forth they go, men, women, and children, two, three or more days' journey, to build their bamboo huts near some spot where they may raise food ; men and women may on those occasions be seen toiling up the steep hills, their conical baskets on their backs, fastened by a strap passing round the forehead ; in some their children sleeping contentedly, others containing their worldly goods. I have entered deserted villages, in which perhaps half the people's property, such as it was, had been left, until they could return and take it away at leisure ; there were baskets of rice, *dhan*, pounding mortars, cotton spinning and weaving machines. I have even seen spoons, the bowl rudely cut out of wood, and a bamboo handle lashed on. The cotton cloths these people weave are really excellent, the threads are coloured with various vegetable dyes, blue, red, yellow, &c. and are frequently woven into very handsome patterns.

The houses of the hill tribes are built entirely of bamboo in the walls, the supports, and the flooring. They are roofed with leaves of the same plant. The houses are raised on platforms, and from the steepness of the hills, oneside may be from twelve to fifteen feet above the ground, and being supported by bamboo props, not more than two inches in diameter, they look very slight ; but last well, with trifling repairs, for three years, the general period for which they are required. The chief's house usually consists of a spacious hall, extending right across the dwelling, in which the feasts are held, and where is always a large hearth of plastered mud, on which a whole ox might be roasted ; on either side of the hall are separate rooms for the different members of the family, the unmarried sons and daughters. The houses of the people of course are not on such a large scale as the chief's, but they are spacious ; two families sometimes live together, in which case they ordinarily cook and eat separately.

The villages consist of from twenty to forty, or fifty houses, which are built as regularly as the nature of the ground will admit. The rapidity with which these people will run up a bamboo hut is surprising. Journeying in the hills, I have come to halting ground for the night, fifty *Ku-mis* with their *dhas* leap into the bamboo forest, which resounds with the sharp strokes of the *dha* in rapid succession, and forth they come, dragging the slender stems after them in bundles of eight or ten.

These are cut to the required size for the platform and roof supports, split and crushed for the walls and floor; the leaves formed into slate-like pieces, bound with battens; thin strips are cut to tie the whole fabric together, and in less than an hour, out of the confused rush of fifty dark forms, each has found his proper place and work, and there stands a comfortable house, which will shelter one from a severe storm, should it appear.

The villages of the remoter tribes are generally built on the tops of hills not easy of access; in these situations there is a scarcity of water for six months in the year, and the people are obliged to descend daily to the lowest dells for that necessary of life. These villages are invariably stockaded, and the ground in the vicinity thickly studded with sharp bamboo spikes, to prevent the approach of foes; they are as hard as iron, and to bare-footed men are a great hindrance, especially in the night time. The tribes somewhat within our border, have abandoned or neglected this system of stockading their villages, and unfortunately some of them have suffered severely; but no tribe within our border has attacked another so situated since April 1837.* Different clans of *Ku-mis* attack each other; there is a feeling of jealousy between clans of the same tribe living upon different streams, and those clans of *Ku-mis* living beyond the British frontier, consider those within as fair game. Their native arms for attack and defence are spears, bows, arrows, and square leathern shields, about three and a half feet long, by two feet broad. Even the most distant tribes now possess muskets and ammunition, which are conveyed up the *Kola-dan* by petty merchants, and thence passed from tribe to tribe far into the interior. They use poisoned arrows in the chase, but I think not in war.

One grand necessary of life—salt, the remote tribes have great difficulty in procuring. The *Ku-mis* of the *Kola-dan* procure it and salt fish from *Akyab*; among them it is plentiful. The tribe living higher up the *Kola-dan*, beyond the British frontier, receive a good deal from Cox's Bazar, through the *Khy-oung-thas*, living in the hills east of *Ramoo*. Some tribes further removed, and isolated by savage feuds, cannot procure salt at all times, so content themselves with an

* When a terrible slaughter was made of a *Khyeng* village on the *Le-myo*, by a *Kumi* chief of the *Kola-dan*.

alkali, which they have the ingenuity to obtain by the combustion of bamboo. Powerful outside clans frequently force supplies of salt and gunpowder from their inner and weaker neighbours.

The great art of war among the *Arakan* hill tribes is, to fall on the enemy by surprise. If they are discovered before reaching a village of attack, they effect a retreat. An open advance in day-light is utterly inconsistent with their ideas of warfare. Before starting on an expedition, they send trusty spies to ascertain the best mode of approach; numerous are the feasts and ceremonies practiced to propitiate the spirits of the mountain; then they march, four, five, or six days' journey, and burst upon the devoted village an hour or two before dawn. These attacks are sometimes made through revenge, the consequence of feuds existing for many years; but generally the great object is to take prisoners who may be made slaves, women, and children therefore are captured; the men are generally slaughtered without mercy; they would be too troublesome to keep. The prisoners are sold from tribe to tribe. I have sometimes been fortunate enough to recover *Khyeng* women and children, poor creatures who had been carried from their original homes amidst the *Yu-ma* mountains, about two hundred miles. This appeared a very world of distance to them, in a mountainous country, where communication is so difficult. The *Khyeng* women have their faces tattooed in a remarkable manner, and being the only tribe who follow this custom, they are easily recognized amidst other people.

I need scarcely remark, that none of the hill tribes are acquainted with the use of letters. A few words of their languages will be found in Appendix D. They are the same as those published in the "Comparison of Indo-Chinese languages," by the Rev. N. Brown of Sudya, in the *Journal of the Asiatic Society* for December 1837. Separate clans of *Ku-mis* and *Khyengs* differ from each other in their words for some objects.

On the tribe called "Lung-khe."

On the upper course of the river *Kola-dan*, and generally located to the west of that river, beyond the British frontier, there exists a tribe called by the *Ku-mis* and *Ra-khoing-thas*, *Lung-khe*. They

are sometimes called *Boung-ju* and *Boung-jwe*. It is this extraordinary variety of names given to one and the same people, that leads to so much confusion, and causes so much difficulty in attempting to classify the different tribes. Another difficulty is, the inability of these people to give any connected account of themselves. The most that can be done, is to treasure up what they incidentally let fall, and draw inferences from it; to gain a knowledge of them by direct questions is almost hopeless, for they will give different answers to the same questions day after day, not I conceive from any wish to deceive, but from ignorance, and inability to reflect.

In my inquiries concerning the *Lung-khes*, I learnt sufficient to make it appear probable, that the *Lung-khes* and *Boung-jwes* were originally separate tribes, who had been conquered and reduced to slavery by a third. Their present *toung-meng*, or chief, is named *Leng-kung*, and he describes himself as belonging originally to a very powerful tribe to the N. E. of his present seat; his clan in that tribe is named *Hlaing-ji-u*, *Hlaing-chou*, *Hling-ju*, and *Hleng-tchyö*.* Several generations back, a portion of his clan coming from the N. E. subdued the *Lung-khes* and *Boung-jwes*, and though still retaining intercourse with his ancestor's nation, yet his dialect, he states, has become changed. The nation from which he is descended, is called by the *Ku-mis*, *Tsein-du*, or *Shin-du*, a corruption probably of the clan-name *Hling-ju*, but as the *Ku-mis* use the term for the whole people, I shall adopt it with the same signification in this paper. I could not discover from the *Lung-khe* chief, that they had any generic name for the whole people. In speaking of the *Tsein-dus*, he used the term *Que-sak*, which he said signifies in his tongue, "upper people," or people living in the upper country; while he and those of his clan, who separated, as above described, are called by the *Tsein-dus*, *Que-tang* or *Que-plang*, *i. e.* "people living lower down;" referring either to the course of streams, or to the diminished elevation of the hills. The *Ku-mis* have a great dread of the *Tsein-dus*.

I must proceed to narrate how I first met the *Lung-khe* chief, for he formerly lived in independence beyond the British frontier.

* I heard these four pronunciations given for the clan-name, by *Leng-kung* and his brother.

In October 1838, the village of *Hleng-kreing*,* a powerful *Kumi* chief of the *Kola-dan*, was attacked by the *Lung-khes*. The attack took place in the dead of the night, and the surprise was complete. Between thirty and forty persons were killed in the village, and thirty-eight women and children were carried into slavery. This attack was headed by *Leng-kung*, a young man of 23 or 24 years of age. A party of the *Arakan* Local Battalion was sent in pursuit of the *Lung-khes*, but they abandoned their village, and fled with their captives into the hills, where it would have been useless to follow. In December of the same year, I proceeded up the *Kola-dan*, to make inquiries regarding the assailants, and found they had abandoned the site of their village, and gone westward with their prisoners, putting themselves under the protection of a *Kyoung-tha* family, living within the hill boundaries of the *Chittagong* district.† Being assured of this by persons whom I sent to ascertain the fact, I addressed the Magistrate of *Chittagong*, who recovered no less than thirty-three women and children that had been captured in *Hleng-kreing's* village; these were restored to their homes; one among them being the chief's daughter; two had been killed in retreat, and three sold to the *Tsein-dus*.

Shortly after their recovery, *Leng-kung* himself, and his elder brother *Leng-hung*, came down to *Akyab* to answer for their misdeeds. *Leng-kung* so far from denying that he headed the attack, gloried in it, averring, that "thirty years before, *Dha-boing-gyee* had attacked his tribe, killed a number of men, carried off several captive, and dug up his grandfather's bones,‡ plundering the grave of the various implements of war and state, which are always buried with a chief." This sacrilege the young man declared he had been brought up to avenge, and his eyes gleamed with delight as he told of his success! An elder brother accompanied him to *Akyab*, but the younger, from his superior energy and ability, possessed all authority in the tribe. From *Leng-kung* I

* This chief is generally called *Dha-boing-gyee*, a title of one of the officers of state under the *Arakan* kings, which he has assumed.

† This *Ky-oung-tha* family, the present head of whom is named *Thak-tang-phyoo*, emigrated from *Arakan* about 60 years since.

‡ The *Lung-khes* and *Tsein-dus* bury their dead, differing from the *Ku-mis* in this respect, who burn them.

learnt the following particulars regarding the *Lung-khes* and *Tsein-dus* :—

“ The *Lung-khes* subject to me, amount to three hundred houses ; they are all my slaves, except the immediate members of my family ; we live in bamboo houses like the *Ku-mis* ; we receive iron from the *Tsein-dus*, and salt from the *Ku-mis* ; our cultivation in the hills is *toung-ya* like theirs ; our language and that of the *Tsein-dus* is nearly alike ; we possess cows, pigs, goats, cats, and fowls ; we bury our dead ; the corpse is placed in a sitting posture, with a pipe in its mouth, food by its side, and *kung* ;* besides these a *moung*, (Burman gong,) sword and spear, together with the feathers worn in the hair by men of rank.

“ We worship four *Nats*, (spirits,) who are called *Que-sing*, *Sur-par*, *Put-ten*, and *Wan-chung* ; *Sur-par* is the head *Nat* ; he lives in the sky, and so do the others. There are cities in the sky where the dead men live ; there are many countries there, where trees bear food ready cooked, and clothes, and all things necessary. If men do not worship the *Nats*, when they sicken they die ; we worship once or twice a-year in the village, by sacrificing a buffalo, or pig, and drinking *kung* ; we do so to benefit ourselves, our wives, and children, and that no sickness may arise ; in the cultivation we have another sacrifice of goats and pigs to the *Nats* of the earth and water ; there are no names for those *Nats* ; for them we kill a fowl and throw it into the water, and leave meat or rice exposed on the ground. All men sacrifice for themselves, but we have *tsha-yas*, (instructors,) who at festivals are the first to bring the *kung*, and adjure the spirits. What they say I do not understand ; only a *tsha-ya's* son can succeed him. They have nothing to say to marriages or funerals. In marriages, the father and brother of the damsel are presented with clothes, brass ornaments, cattle, &c. A great feast takes place. I (*Leng-kung*,) gave the value of thirty cows for my wife. A son can marry his father's inferior wife, after the father's death. A chief can marry as many wives as he pleases. When a woman of rank dies, a cow is killed and eaten, and the people drink and dance ; she is buried in a grave lined with stones, and sometimes valuables are buried with her ; not always ; we do not practice witchcraft, but other people around us do. A man's life when he dies,

* An intoxicating drink.

goes to the sky ; all men, whether good or bad, go there. Our fathers who have gone before, we see in dreams, and they see us."

I learnt from *Leng-kung* some particulars respecting the *Tsein-dus* nation. It consists of the following clans :—

- | | |
|------------------------|-------------------------|
| 1. <i>Tjin-dza</i> ,* | 8. <i>Ting-lhoul</i> , |
| 2. <i>Za-tang</i> , | 9. <i>Ti-a-dai</i> , |
| 3. <i>Keng-lot</i> , | 10. <i>Rul-bu</i> , |
| 4. <i>Lhon-shin</i> , | 11. <i>Boi-kheng</i> , |
| 5. <i>Til-teng</i> , | 12. <i>Chung-ngla</i> , |
| 6. <i>Rwol-lweng</i> , | 13. <i>Hlaing-ju</i> . |
| 7. <i>M'lhul</i> , | |

This last clan the *Lung-khe* chief originally belonged to ; there are still some villages of it, he said, remaining among the *Tsein-dus*.

The *Tsein-dus* observe the same ceremonies in burying their dead that have been mentioned above. Their country is very extensive, fifteen days' journey, my informant said, from one end to the other.† There are several hundred villages of them. The village sites are not moved periodically like those of the *Ku-mis* and *Lung-khes*, for much of their cultivation is in elevated plains, and comparatively broad valleys, which admit of continued cultivation ; they work with hoes or spades, not ploughs ; they have not so much cotton and rice as the *Ku-mis*, but a greater variety of vegetables, as yams, pumpkins, &c. They manufacture their own salt from brine springs existing in their country ; the salt, said my informant, "is like stone, white and somewhat bitter in flavour ;" to obtain it, they boil the brine in iron vessels, which they obtain from the province of *Yan* in Burmah. No salt is obtained from bamboo ; in fact my informant declared positively there were no bamboos in the *Tsein-du* country, a statement scarcely credible ; the houses are built entirely of plank ; the roofs are of plank for great men, but the poorer classes use grass ; men chiefly perform field labour ; the wives of very poor men only perform out-door work. The religious notions of the *Tsein-dus* correspond with those of the *Lung-khe* chief.

* The head of this clan is *Van-u*, whose sister named *Terh-rhal*, *Leng-kung* married.

† I have been informed that *Kumi* tribes bordering on the *Tsein-dus* have heard from them of white foreigners far to the North, to whom some of their clans paid tribute. The country these clans paid to, they called *A-syn*. It can scarcely be Assam ; they may probably mean Cachar. But it is certain that they are acquainted with the fact of Europeans having possessions to the north of them.

The *Tsein-dus* receive from the province of *Yan*, ponies and horned cattle. When *Leng-kung* and his brother first arrived at *Akyab*, they were dressed in handsome silks procured through the *Tsein-dus* from *Yan*. The former wore also a tiara of dark feathers, his distinguishing mark as chief.

Since writing the above, I have received accounts of the death of *Leng-kung*, supposed to have been caused by poison administered to him; such is the story of the hill people. Certain it is, however, that the *Tsein-dus* marched to revenge his death, and plundered a *Khyoung-tha* village on the *Chittagong* frontier in May last. Endeavours are now being made to recover the *Khyoung-tha* prisoners from the *Tsein-dus*. On the death of *Leng-kung*, his tribe dispersed; his imbecile brother will not be able to keep the people together, and they will probably become incorporated in other tribes.

I abstract from various Tables furnished to me by the author of the above interesting report—returns, as follow, showing the high progressive prosperity of *Arakan* within the few past years:—

The Revenues of Arakan were,

						Rupees.
In 1832-33,	...	...	...	...	...	2,48,569
1833-34,	...	...	...	...	...	2,80,304
1834-35,	...	...	...	...	...	3,10,168
1835-36,	...	...	...	...	...	2,87,016
1836-37,	...	...	...	...	...	3,26,293
1837-38,	...	...	...	...	...	3,35,731
1838-39,	...	...	...	...	...	3,80,287
1839-40,	...	...	...	...	...	3,79,809
1840-41,	...	...	...	...	...	3,79,697

Since 1837-38, taxes on forest produce, huts, boats, houses, sugar presses, handicraftsmen, bachelors, &c. &c. (which prevailed as part of the ancient revenue system of *Arakan*;) had been abolished to the extent of 97,349 rupees a-year; the beneficial effect of this measure is shewn in the enhanced revenue, and trade of the province. In 1834-35, the number of square-rigged vessels which cleared out from *Akyab* was 140; in 1840-41, it was 709; in the first named year the tonnage was 16,000 tons; in the last noted 82,111 tons. In 1834-35, rice to the extent of 4,25,040 maunds, valued at rupees 1,73,636 was exported from *Akyab*. The rice exports in 1840-41, were from the same port 26,54,298 maunds, and their value rupees 11,42,187. I have returns for the intermediate and some preceding years, but give these as years of fair comparison.



English	Burmese.	Lung-khé	Koladan Koo-mí.	Mee Koo-mí.	Kyó.	Lémyó Kyng.	Doing-nak.	Mrúng.
Air.	lé,	hlé or khlé,	A-lí,	ka-lí,	Alí,	khyí,	bó,	nau-bá.
Ant,	paynetseik,	nghet-té,	Pa-leng,	ma-ling,	ma-tsí,	pa-lein-tsa,	—	—
Arrow,	mya,	lee,	tá-i,	tsa-kó-i,	—	khá,	lé,	lé
Bird,	nghet,	wá,	tó-ó,	ka-wá,	wá,	bó hau,	—	hó.
Blood,	thwé,	atí,	t'hí,	a-tí,	t'hí,	a-tí,	—	—
Boat,	hlé,	laung,	p'laung,	mí-laung,	p'laung,	laung,	nó,	rúng.
Bone,	ayó,	a-rú,	a-hók,	a-kú-náng,	rú,	mwé-hau,	ar,	ba-kre,
Buffalo,	kyué,	ná,	pa-nó,	ma-ná,	cha-láwé,	nau,	mó-it,	ma-shí.
Cat,	kyaung,	sí-yó,	mí-yaung,	nim-bó-i,	mí,	mím,	bí-lá-í,	a-mí.
Cow,	nwá,	tchó,	tsí,	kha-bó-i,	char-rá,	shyá,	gó-rú,	ma-cháu.
Crow,	kyí,	lang-á,	ú-ák,	m'kyí, & wá,	wut,	áng-ô,	ko-bá,	tuk-quá.
Day,	né,	sún,	kan-ní,	a-hóng-nát,	—	ta-ní,	dín,	tsa-ló.
Dog,	khwé,	wí,	wí,	ú-i,	bú-i,	ú-i,	kú-gúr,	tchái.
Ear,	ná,	huá,	kun-nó,	ka-ná,	ná,	hnó,	kán,	kúng-jú.
Earth,	myé,	w'lé,	ku-lóng,	lé-kóng,	ní,	teit.	—	—
Egg,	ú,	wat-tí,	ku-dú-i,	a-dú-i,	a-twí,	a-tú-í	—	—
Elephant,	sheu,	tsái,	kus-á-í,	ku-shá-í,	sang-hung,	mwí,	—	—
Eye,	myetsé,	mik,	a-mík,	a-mí,	mé-tô,	mí-ú-í,	sóp,	ma-quá.
Father,	a-phé,	ká-phá,	Nga-á-í,	pha-á-í,	bá,	bó,	báp,	a-bhá.
Fire,	mí,	mé,	ma-í,	má-it,	—	mí,	a-gú-in,	—
Fish,	ngá,	ngá,	ngó,	mwé,	ngwáu,	ngó,	máit,	a-á.
Flower,	pan-bwen,	pár,	ka-shong,	a-pá,	pá,	pa-pá,	—	—
Foot,	khyé,	ké,	a-kók,	a-kauk,	pát,	ashí,	teng,	ya-kóng.
Goat,	sheik,	kél,	mé-é,	sú-bé,	ké-rát,	mé,	sa-gol,	pún.
Hair,	shaben,	tsám,	tchán,	a-sháng,	tchán,	sáng,	súl,	buk-ka-ná i.
Hand,	let,	kut,	kók,	a-kú,	quét,	kúth,	hát,	yák.
Head,	ghaung,	lú,	hlú,	a-lú-a-sán,	lú,	lú, lú-gú,	tsir-rá,	bó-kráo.
Hog,	wet,	wok,	áu,	áu,	wet,	wut,	sú-gur,	wá.
Horn,	khyo,	a-kí,	tug-gí,	a-tá-kí,	yu-é,	a-hyí,	—	—
Horse,	myen,	ráng,	kaung-ó,	ka-phúk,	shá,	tsá,	gó-ra,	go-rá.
House,	eing,	eing,	úm,	eing,	ing,	eing,	gur,	náo.
Iron,	than,	tír,	ta-mó,	ka-dáng,	ki-ying,	htí,	ló-á,	tchó.
Leaf,	yuet,	ting-nhá,	tehaung-ngam,	la-káng,	ting-ka-nú,	tein-tshoinghá,	—	—
Light, (dawn),	len,	qué-dé,	kú-wang,	kun-ní,	kwé-wá-tá,	a-wá,	—	—
Man,	lú,	má-nún,	kú-mí,	kú-mí,	ma-shí,	kyáng,	mo-rót,	tsa-lá.
Monkey,	myauk,	yaung,	kú-láit,	ka-lá-í,	ró-á,	yaung,	—	—
Moon,	lá,	hla-pá,	ló,	slú,	kyá,	khro,	thán,	tá.
Mother,	amé,	ka-nú,	na-o-í,	nwé-í,	núng,	nú,	má,	a-mó.
Mountain,	taung,	kláng, sláng,	mú-é,	ta-kúng,	hláng,	kón,	mú-rá.	lái.
Mouth,	uhók-payát	a-ká,	la-baung,	úk-khá,	ma-kás,	a-hmaung,	—	—
Musquito.	khyeen,	mur-song,	cháng-rang,	kháng-tsá-áng	sa-nung,	hau-bau,	—	—
Name,	namé,	m'núng, a-ming,	a-mún,	náng-pá-mé,	—	ná-hmé-ú,	—	—
Night,	nya,	yán,	wím,	ma-kúng,	kul-lók,	tseit-yón,	ráit,	hur-ró.
Oil,	tsí,	tsí,	a-tauk,	tsa-ting-twí,	chú-rúp,	tsí,	—	—
Plantain,	nghet-pyo,	bal-lhá,	kút-tí,	kú-ti-teing,	kyá-lú,	hnám-bó,	ko-lá,	—
River,	myít,	tí-wá,	yáng-páng,	ta-ghá,	tí-póe,	hau-laung,	gáng,	tei-bú.
Road,	lán,	lán,	lám,	láng,	lám,	láng,	—	làn.
Salt,	shá,	she-té,	pa-ló-í,	ma-lwé,	ma-tsí,	ma-tsí,	—	—
Skin,	tha-yé,	sa-win,	mó-e-pik,	a-múí,	mé-wan,	nau-wan,	—	—
Sky,	mó,	wán, wyn,	ka-ní,	quem-nú,	mí-tsúk,	né-bí,	—	—
Snake,	myué,	rúl, rúi,	pú-wí,	ma-quí,	mí-yúk,	pwá,	tsáp,	tsé-bú.
Star,	kyé,	ár-fwí,	kus shí,	a-sí,	ar-shí,	áá-shin,	ta-rá,	hán-dô-gri.
Stone,	khyauk,	lúm,	lóng-tchóng,	ka-lúng,	lúng,	lúm,	sil,	kú-laung.
Sun,	né,	ní,	ka-ní,	kan-ní-ta-lúp,	nè-tchú,	ko-nhí-ó	—	—
Tiger,	kyá,	tchek-ké,	tuk-káe,	ta-gá-in,	kích,	kyé,	—	—
Tooth,	thwá,	há,	hó-ó,	a-phá,	há,	a-hó,	—	—
Tree,	thit-pen,	ting,	a-kúng,	ta-góm,	ting,	teing,	gá-ít,	ba-páng-
Village,	yuá,	qwá,	a-wung,	wáng,	kó,	náng,	para,	—
Water,	yé,	tí,	tú í,	tú-í,	tú-wé,	tú-í,	páon,	tei.
Yam,	myák-khaung,	burh-rá-rátáung,	ho,	khá,	pát,	bwá,	a-lú,	htá.

Table of Proportional Logarithms. By Captain ROBERT
SHORTREDE.

The accompanying is a Table of Proportional Logarithms, which I have lately constructed with a view to diminish their size, and at the same time considerably extend their use.

Proportional Logarithms are commonly arranged in vertical columns of 60 each, and the construction is such, that the larger the Logarithm the less is the corresponding quantity. I have never been able to perceive any great benefit resulting from such a system, but often I have felt much inconvenience from the want of an arrangement analogous to that of Tables of common Logarithms.

The present is a specimen of what I conceive to be the most convenient form of Table. The Logarithms here given are the arithmetical complements of those in common use,* so that they increase along with the quantities to which they belong, and the arrangement is such, as to retain the advantages of the decimal as well as the sexagesimal subdivision. The Table was intended primarily to facilitate the finding of proportional parts for minutes and seconds, in a set of Tables in which the quantities were tabulated for every 10, and it was immediately obvious, that it would serve equally for seconds and decimals when the quantities are tabulated, as in Hutton's Tables, to every minute, and generally for any quantities whose subdivisions are by 6, 60, or 600, &c.

The column marked ' " contains minutes and even ten seconds from 1 to 9'.50. The col. marked N contains $\frac{1}{10}$ th of the seconds in the former; the odd integers being found in the head line of the Table exactly as in Tables of Common Logarithms. The column marked *common difference*, gives the mean value at the middle of the line opposite which it stands: and beyond this are proportional parts for the decimal subdivisions of the mean common difference.

The use of the Table is very simple. The fractional part of 10' or 1' being found in the proper column (' " or N, as the case may be) take out the corresponding Logarithm; to this add the log. opposite the Tabular Difference found by column N; the sum of these is the logarithm of a number which found in column N is the proportional part required.

* If the term Proportional Logarithms be considered as being already definitively appropriated otherwise, those here given may be called Co-proportional or Arco-proportional Logarithms, or Anti-proportional, or Proportial, or Correctional, or any other term which may be preferred.

Example.—The Table Diff. for 10' being 461, required the proportional part for 4' 10''.

Opposite 4'.10'' (column' ") is the logarithm, 6198

Opposite 461 column N. is 8855

The sum is, 5053

The next less log. in the Table is 5051, corresponding to 192, and for the difference 2, the table of proportional parts gives .1, hence the whole proportional part is 192.1.

Required the log. sin. and tan. of $22^{\circ} 27' 37''.3$, using Hutton's Tables.

For 37.3 Proportional Log. is, .. 7936	Tab. Diff. for tan. 3579 P.L. 7756
For 3056 the Tab. Diff. for sin P.L. 7069	N 2225 5692
N 1899.6 5005	L tang. 616 1514
Log. sin..... $22^{\circ} 27' = 9.581\ 9236$	9.616 3739
Log. sin.... $22^{\circ} 27' 37''.3 = 9.5821\ 135.6$	

It very often happens, that the correction for 2d difference is omitted, though it may be sufficiently large to affect the result. To make this correction as little troublesome as may be, I have prefixed a set of decimal factors, which multiplied by the second difference will give the correction to be applied, with a sign opposite to that of the 2d difference. For example in Hutton's Tables, the log. sin. of $22^{\circ} 27'$ has a 2d difference of 3. The coefficient for 2d difference at 37.3 is .119, this multiplied by 3 is .357 or .4; which *added* to the result above found, gives 9.5821136 as the log. sin. of $22^{\circ} 27' 37''.3$.

The Table here given has no indices. The want of them may be supplied by the following Rule. When the fractional part of 10' for which proportion is required is between 10' and 1' the result is greater than $\frac{1}{10}$ of the Tabular Difference, when between 1' and 6'' the result is between $\frac{1}{10}$ and $\frac{1}{100}$ of Tab. Diff.

When the Tab. Diff. is for 1', then between 1' and 6'' the result is greater than $\frac{1}{10}$ of the Tab. Diff. and similarly in other cases.

P.S.—In using this Table to find the Logistic Log. for 1 hour, the fractional interval is to be reduced to decimal of minute, and found in column N.; the Logistic Log. is the arithmetical complement of the rithm in the Table. And similarly, if the whole term be 3 hours,

reduce as above and divide by 3. Also for 12 hours, reduce to decimal of hours and divide by 2 (for 24 hours divide by 4) ; the qualities being thus brought into tenths of hours, col. N. will serve as before, the arithmetical complement of the Tabular Log. being the Proportional Log. of the usual sort, to which apply if need be, the proper index.

R. S.

Coefficient for Δ .	Proportional Logarithms for 10 minutes : as also for 1 minute, or 1 degree, or 1 hour.												Common Difference.	Proportional Parts.								
	..	N.	0	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9
.045	1	00	0000	0072	0142	0212	0280	0348	0414	0479	0544	0607	67	7	13	20	27	34	40	47	54	61
.052	10	7	0669	0731	0792	0852	0911	0969	1027	1083	1139	1195	58	6	12	18	23	29	35	41	47	53
.058	20	8	1249	1303	1357	1409	1461	1513	1563	1614	1663	1712	52	5	10	16	21	26	31	36	41	46
.064	30	9	1761	1809	1856	1903	1950	1996	2041	2086	2131	2175	46	5	9	14	18	23	28	32	37	42
.069	40	10	2218	2262	2304	2347	2389	2430	2472	2512	2553	2593	42	4	8	12	17	21	25	29	33	37
.075	50	11	2632	2672	2711	2749	2788	2825	2863	2900	2937	2974	38	4	8	11	15	19	23	27	30	34
.080	2	00	3010	3046	3072	3118	3153	3188	3222	3257	3291	3324	35	3	7	10	14	17	21	24	28	31
.085	10	13	3358	3391	3424	3457	3490	3522	3554	3586	3617	3649	32	3	6	10	13	16	20	23	27	30
.089	20	14	3680	3711	3741	3772	3802	3832	3862	3892	3921	3950	30	3	6	9	12	15	18	21	24	27
.094	30	15	3979	4008	4037	4065	4094	4122	4150	4177	4205	4232	28	3	6	8	11	14	17	20	23	25
.098	40	16	4260	4287	4314	4340	4367	4393	4420	4446	4472	4497	26	3	5	8	11	13	16	19	21	24
.102	50	17	4523	4548	4574	4599	4624	4649	4674	4698	4723	4747	25	3	5	7	10	12	14	17	20	22
.105	3	00	18	4771	4795	4819	4843	4867	4890	4914	4937	4960	24	2	5	7	10	12	14	17	19	21
.108	10	19	5006	5029	5051	5074	5097	5119	5141	5163	5185	5207	22	2	4	7	9	11	13	16	18	20
.111	20	20	5229	5250	5270	5293	5315	5336	5357	5378	5399	5420	21	2	4	6	8	11	13	15	17	19
.114	30	21	5441	5461	5482	5502	5523	5543	5563	5583	5603	5623	20	2	4	6	8	10	12	14	16	18
.116	40	22	5443	5662	5682	5702	5721	5740	5760	5779	5798	5817	19	2	4	6	8	10	12	14	16	17
.118	50	23	5836	5855	5873	5892	5911	5929	5948	5966	5984	6002	19	2	4	6	8	9	11	13	15	17
.120	4	00	24	6021	6039	6057	6075	6092	6110	6128	6145	6164	18	2	4	5	7	9	11	12	14	16
.122	10	25	6198	6215	6232	6249	6267	6284	6301	6318	6335	6351	17	2	3	5	7	9	10	12	14	15
.123	20	26	6368	6385	6402	6418	6435	6451	6467	6484	6500	6516	16	2	3	5	7	8	10	12	13	15
.124	30	27	6532	6548	6564	6580	6596	6612	6628	6643	6659	6675	16	2	3	5	6	8	10	11	13	14
.124	40	28	6690	6706	6721	6736	6752	6767	6782	6797	6812	6827	15	2	3	5	6	8	9	11	12	14
.125	50	29	6842	6857	6872	6887	6902	6917	6931	6946	6961	6975	15	1	3	4	6	7	9	10	12	13
.125	5	00	30	6990	7004	7019	7033	7047	7061	7076	7090	7104	14	1	3	4	6	7	8	10	11	13
.125	10	31	7132	7146	7160	7174	7188	7202	7215	7229	7243	7256	14	1	3	4	5	7	8	9	11	12
.124	20	32	7270	7284	7297	7311	7324	7337	7351	7364	7377	7390	13	1	3	4	5	7	8	9	10	12
.124	30	33	7404	7417	7430	7443	7456	7469	7482	7495	7508	7520	13	1	3	4	5	7	8	9	10	12
.123	40	34	7533	7546	7559	7571	7584	7597	7609	7622	7634	7647	13	1	3	4	5	6	8	9	10	11
.122	50	35	7659	7672	7684	7696	7709	7721	7733	7745	7757	7769	12	1	2	4	5	6	7	9	10	11
.120	6	00	36	7782	7794	7806	7818	7830	7841	7853	7865	7877	12	1	2	4	5	6	7	8	10	11
.118	10	37	7901	7912	7924	7936	7947	7959	7970	7982	7993	8005	12	1	2	3	5	6	7	8	9	10
.116	20	38	8016	8028	8039	8050	8062	8073	8084	8096	8107	8118	11	1	2	3	5	6	7	8	9	10
.114	30	39	8129	8140	8151	8162	8173	8184	8195	8206	8217	8228	11	1	2	3	4	6	7	8	9	10
.111	40	40	8239	8250	8261	8272	8282	8293	8304	8314	8325	8336	11	1	2	3	4	5	6	8	9	10
.108	50	41	8346	8357	8367	8378	8388	8399	8409	8420	8430	8441	10	1	2	3	4	5	6	7	8	9
.105	7	00	42	8451	8461	8472	8482	8492	8502	8513	8523	8533	8543	10	1	2	3	4	5	6	7	8
.102	10	43	8553	8563	8573	8583	8593	8603	8613	8623	8633	8643	10	1	2	3	4	5	6	7	8	9
.098	20	44	8653	8663	8673	8683	8692	8702	8712	8722	8731	8741	10	1	2	3	4	5	6	7	8	9
.094	30	45	8751	8760	8770	8779	8789	8799	8808	8818	8827	8837	10	1	2	3	4	5	6	7	8	8
.089	40	46	8846	8855	8865	8874	8884	8893	8902	8912	8921	8930	9	1	2	3	4	5	6	7	7	8
.085	50	47	8939	8949	8958	8967	8976	8985	8995	9004	9013	9022	9	1	2	3	4	5	6	7	7	8
.080	8	00	48	9031	9040	9049	9058	9067	9076	9085	9094	9103	9	1	2	3	4	5	6	7	7	8
.075	10	49	9120	9129	9138	9147	9156	9165	9173	9182	9191	9199	9	1	2	3	4	5	6	7	7	8
.069	20	50	9208	9217	9226	9234	9243	9251	9260	9269	9277	9286	9	1	2	3	3	4	5	6	7	8
.064	30	51	9294	9303	9311	9320	9328	9337	9345	9353	9362	9370	8	1	2	3	3	4	5	6	7	7
.058	40	52	9379	9387	9395	9404	9412	9420	9428	9437	9445	9453	8	1	2	2	3	4	5	6	7	7
.052	50	53	9461	9469	9478	9486	9494	9502	9510	9518	9526	9534	8	1	2	2	3	4	5	6	7	7
.045	9	00	54	9542	9550	9558	9566	9574	9582	9590	9598	9606	8	1	2	2	3	4	5	6	6	7
.038	10	55	9622	9630	9638	9646	9654	9661	9669	9677	9685	9693	8	1	2	2	3	4	5	5	6	7
.031	20	56	9700	9708	9716	9724	9731	9739	9747	9754	9762	9770	8	1	2	2	3	4	5	5	6	7
.024	30	57	9777	9785	9792	9800	9808	9815	9823	9830	9838	9845	8	1	2	2	3	4	5	5	6	7
.016	40	58	9853	9860	9868	9875	9883	9890	9897	9905	9912	9920	7	1	1	2	3	4	4	5	6	7
.008	50	59	9927	9934	9942	9949	9956	9964	9971	9978	9985	9993	7	1	1	2	3	4	4	5	6	7

Memorandum on Nurma Cotton. By H. PIDDINGTON, Esq.

A very fine silky cotton having been sent to the Secretary of the Asiatic Society, Mr. Torrens, with some other productions from Kho-rassan, I find on reference to the Transactions of the Agricultural Society, that it is well known in Malwa. Believing it to be of importance that this cotton should have a trial under the American experimentalists, I have ventured to suggest that seed* should be procured in Malwa, and dispatched to Captain Bayles without delay.†

It is also of great importance to obtain specimens of the *soils* in which the Nurma cotton is grown in Malwa; and from the experimental cotton farms, so as to ascertain their identity, or to see what manure may be required. I take the liberty then of subjoining the following queries and directions:—

1. What is the Nurma cotton in Malwa? Is it the common cotton of the country; or a choice sort?
2. Does it grow on any common cotton soil? or are peculiar soils and spots sought out for it?
3. What manure (if any) is used to it?
4. When sown? How sown? When harvested? How cleared?
5. What price does the best sort command? Where is it exported to, if at all?
6. Is it an annual cotton? or does it last more than one year?
7. If it grows on *any* cotton soil, please to select specimens from a couple of the best fields you can find out; if from any peculiar sort of soil, such as red, or white, or black, then form all the sorts.
8. If from a peculiar soil, a specimen of the surrounding common soil of the country would be desirable.
9. Specimens of the soils should be sent as follows:—
 - a. For sending by dawk-banghy, a large tin wafer-box for each sort is the handiest package; but a larger quantity should be taken to furnish samples to Museums, Societies, &c. This may be sent afterwards.

* Seed of *Nurma* from Herat, procured by me, is now on its way to Captain Bayles.

† I am assuming here that he is not acquainted with it.

b. Scrape off two or three inches of the soil with the hand, and take your specimen also from the field before any manure has been laid on. The soil at two or three inches deep may pretty nearly be called surface-soil; unless, as in rare cases, it changes at this depth. One specimen should be taken here and another at eighteen inches deep.

c. If any rocks or stones are lying about the fields, these should be sent separately. The same of those below at eighteen inches or two feet deep.

d. The soil should be dried on a hot-water plate, or in a hot sun, that it may not rot the labels.

e. A label should be inclosed *within* the box, and it should also be numbered, so as to refer to a list. The box should also be marked *outside* in ink or paint, on the side, and lid.

f. If the manure used be any kind of earth or stone, samples of it should be sent also.

10. Inquiry should be made if at the time of ripening any peculiar manure is added, as with some of the choice sorts of tobacco. If the plants are *topped*, *i. e.* the young shoots pinched off, or beaten with sticks, or allowed to be eaten down by animals. All these processes are used in various parts of the world, (America, the French and Spanish Colonies, Persia, &c.) and no doubt influence both the productiveness and the quality of the cotton to a great extent.

11. Nothing relative to the native methods of culture, irrigation, &c. should be overlooked.

12. Inquire if it is subject to any diseases or insects, which seriously affect the returns from it.

13. The amount of return in clean merchantable cotton per biga; if a known number of square yards, is of importance; and the average price of the best sorts.

Specimens of the soils are requested for the Museum of Economic Geology now forming; and I shall be glad to afford any assistance in the investigation of their qualities which may be desired.

H. PIDDINGTON.

Calcutta, 31st August, 1841.

P.S.—Since writing this, I learn from Mr. Grant, that the Nurma cotton is so highly prized in Malwa, that the rajahs and great persons will wear no garments, but such as are manufactured from it. He

adds, that Mr. Bruce, now in Bundelcund, can give every information relative to it.

The Persian name *Nurmah*, (*Nurm*, "soft,") being applied to a similar article both in Khorassan and in Malwah, would seem to go far to induce the belief, that the Pathan conquerors of the latter country must have introduced this peculiar cotton into the country they subjugated. The fact is worth noting, as it is not often that disproof of so positive a character can be adduced against the common assertion,—that the Mussulman conquerors of India came rather to destroy totally, than to improve by even partial means.



*Report on some Articles of Trade sent by Lieut. POSTANS from
Khorassan. By H. PIDDINGTON, Esq.*

I. *Guljuleel*.—This is evidently the yellow flower of a plant. It is however so broken up, that I could with difficulty pick out a few entire flowers for sending to Dr. Wallich, whose severe illness has hitherto prevented my obtaining any reply. He thinks them the flowers of a *Delphinium*.

It is stated to be used for dyeing green, of course with indigo. I find that with the common aluminous mordant, it dyes silk and wool a very handsome canary yellow, as per margin; which with indigo becomes a very good green.* Having but very little of it, I did not experiment further, because I thought it might be better to send it home. The yellow resists coarse soap and water well.

In sending it, or any future sample home for trials, great care should be taken to pack it dry. I found that exposed in paper it absorbs moisture very rapidly, and had a slight mouldy smell, so that I was obliged to dry and keep it in a stoppered bottle.

II. *Bhoj-ghund*.—This is, I think, a new sort of galls. It is widely different in shape and appearance from ours, being a small pyriform brown capsule, much resembling a miniature dried pear; it is hollow and empty, the shell being of a gummy elastic consistence, wholly differing from the *Aleppo* gall.

* It has no affinity to Cotton.

As our sample is no doubt a bazar, or even a work-shop sample, we may take it to be one at maturity, at least in the best state for use.

I find that it gives a nearly colourless infusion and a tincture, which does not become deeper than of a Lisbon-wine colour. This last is a very valuable property in using it as a chemical re-agent, in which the dark colour of the tincture of common galls sometimes renders it an equivocal test.

I find, by experiment, that its delicacy is fully equal to that of the best Aleppo galls; and the exceeding small portion of extractive matter which it contains, will I think render it of much value in fine dyeing. I have found that it is procurable in the bazars of Calcutta, under the name of *Pistach-ka-fool*,* (Pistachio flowers,) and that it is brought from the Red Sea and Gulf of Persia by the Arab ships, no doubt for the use of fine dyeing operations. This name would lead us to suppose, that it was the gall-nut of the Pistachio tree, (perhaps of the wild Pistachio? *Pistacia terebinthus*?) Its price in our bazar is too high to allow it to be used extensively, but this is probably, as with many other articles of small consumption, owing to the little demand: three rupees per seer was the retail price. Those which I obtained were very old, and were worm-eaten. I am looking out for some new ones, when I can ascertain the quantities of tannin and gallic acid, should we learn upon reference home, that as I suppose, they would be valuable in the arts.

III. *Gum from various trees, principally the Almond.*—This gum seems to hold a middle place between gum arabic and the common cherry-tree gum; and may possibly be of value if well picked, for the market value of gums depends very much on this process. It softens much in damp weather, but dissolves entirely in cold water, having the solution slightly turbid, though quite colourless; which is a great object in the use of gums in dyeing. It should by all means be sent home for trial.

IV. *Nurma Cotton.*—I had occasion, about a year and a half ago, to assert in print, that “the indigenous cottons of India were very little known to us,” and here is an example of the truth of the assertion. This is a very beautiful silky cotton, of which I should think very

* Or Pistach-ka-fol, Pistachio fruit?

highly, and it is sent to us from Khorassan as a novelty. Now I find that (vol. iv. p. 218,) in the Transactions of the Agricultural Society, is a letter under date 12th April 1837, from J. W. Grant, Esq. referring to this very Nurma Cotton, *as having been grown in Malwa from time immemorial!* It is there compared, in two notes, first to the Sea Island, and then to the Upland Georgia. The fact is, that it has the silky fibre of the Sea Island, and the woolly adherence to the seed of the Upland. It more resembles the fine Manilla cotton, which is always worth a shilling a pound, than any other I can compare it to. The Manilla cotton has like it, the woolly seed.

Ours are perfectly fresh, and Dr. Spry has promised me to send them to Captain Bayles. I have two plants growing in my garden, but I suggest that it may be of much importance to procure a quantity of the seed from Malwa, for the Cotton Experiment-farm, with some of the soil it is grown upon, and some of these of the best spots for cotton about the Cotton Experiment stations. By comparative analysis of these, we shall be certain that if it does not succeed, it will be owing to climate, and we shall go to work safely as far as soil is concerned. I add a separate memorandum, that no time be lost in procuring the seed and soil for the approaching season. If samples of the soils are sent to me, I shall be glad to give any assistance I can in the matter.

V. *Musagh, Walnut-tree bark.*—The use of this at home in dyeing, staining of wood, paper, &c. are so well known, that I have not thought it worth while to experiment upon it.

H. PIDDINGTON.

Museum, 24th August, 1841.

*Note on the Cervus Elaphus (?) of the Sál Forest of Nepál. Hodie,
C. Affinis, nob. By B. H. HODGSON, Esq.*

Many years ago, I announced the existence of the true Stag of Europe in the saul forest of Nepal, upon the strength of a skull and horns in my possession, of which I afterwards published an illustrative sketch in the Journal, giving those of the Sambur or Jarai, and of the Baraiya or *Elaphoïdes*, for comparison; and observing that the latter species and *Wallichii* seemed to form two distinct links in the chain of connexion between what H. Smith regarded as typical Stags of Europe and of Asia, (*Elaphus* and *Hippelaphus*.) It has lately been asserted, however, that I have confounded the common Stag of Europe, of which there is alleged to be no analogue in India, with *C. Wallichii* ;* and, again,† that *C. Wallichii* is really no other than that analogue; there being no grounds for supposing the existence of a third species liker to the Red Deer of Europe than either Wallich's Stag or the Baraiya, which last is pertinaciously called *Du Vaucellii*, despite the explanation afforded long ago in the Journal. I will not enter into discussion with my critics: and I must admit that I have never been able to obtain, or to see, a second specimen of Wallich's, or of the true Stag. Neither do I profess to have lately obtained any new lights as to the leading principle upon which, following H. Smith, I distinguished the several species of *Cervus*, viz. the number and position of the antlers,‡ especially the inferior ones. I too, therefore, may still have my doubts, though they are not precisely those of my critics; for I feel satisfied that there is a Stag in India distinct from the Sambur or *Rusa*, from Wallich's, and from *Du Vaucel's*, and nearer allied to the Red Deer of Europe than any of them; and the accompanying sketch and dimensions will, I think, satisfy most persons that such is the fact:—

* Ogilby, apud Royle.

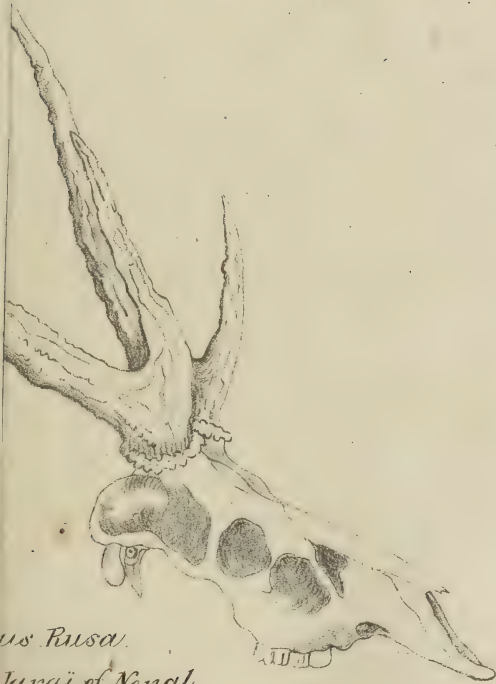
† Blyth, apud Proc. Zool. Soc., 1840, p. 79.

‡ That is, the basal and median, for the upper are said to be more liable to mutability. The true Stag has three of them (directed forward) on each beam, two of which are basal, and the third a median, or royal. Wallich's has two basal and no median: the Baraiya one basal, and no median, but a crown of many snags at the summit, like our Red Deer, but like no other Indian Deer: the Sambur and *Axis* have one basal, no median, and one subterminal antler.

*Dimensions.**Inches.*

<i>Skull</i> .—Extreme length, along the curve, to upper edge					
of foramen magnum, ... ..	...	...	...	...	22 $\frac{1}{2}$
Do. do. to central jut of transverse crest, ... ..	...	...	...	...	19 $\frac{1}{2}$
The same, by <i>rectilinear</i> measure, like all the measures					
that follow, ... ..	...	...	...	...	17 $\frac{1}{2}$
Symph. maxill. to anteal base of the horn, ... ..	...	...	...	...	14
Symph. maxill. to tips of nasals, ... ..	...	...	...	...	3 $\frac{1}{4}$
Length of the nasals, ... ..	...	...	...	...	6 $\frac{3}{4}$
Greatest breadth of nasals, ... ..	...	...	...	...	2 $\frac{3}{8}$
Length of frontals, ... ..	...	...	...	...	5 $\frac{1}{4}$
Greatest width of do., between outer edges of orbits, ...	...	...	...	...	7 $\frac{1}{2}$
Greatest width between outer edges of molar teeth, ...	...	...	...	...	4 $\frac{3}{4}$
Greatest width of occiput, ... ..	...	...	...	...	5 $\frac{7}{8}$
Greatest depth of do. from mesial point of crest to inferior					
edge of condyle of foramen, ... ..	...	...	...	...	4
Length of the intermaxillaries, ... ..	...	...	...	...	5 $\frac{1}{8}$
Greatest width between them, ... ..	...	...	...	...	3 $\frac{1}{4}$
Greatest height of skull from frontal crest to inferior, or					
coronal, edge of first molar tooth, ... ..	...	...	...	...	8
<i>Horns</i> .—Greatest length, along the curve,					
Girth above the burr, ... ..	...	...	...	...	54
Girth between 1st and 2nd basal antlers, ... ..	...	...	...	...	10 $\frac{1}{4}$
Greatest divergency between <i>outer</i> terminal snags, ...	...	...	...	...	10 $\frac{1}{2}$
Interval between <i>inner</i> terminal snags, ... ..	...	...	...	...	47
Length of the basal antler, ... ..	...	...	...	...	26 $\frac{1}{4}$
Length of the median antler, ... ..	...	...	...	...	12
Length of the superior (outer) antler, ... ..	...	...	...	...	8
Length of the superior (outer) antler, ... ..	...	...	...	...	10
Nearest basal interval of the horns, ... ..	...	...	...	...	4

The spoils above measured belonged to an animal of moderate age, being rather young than old, as is proved by the distinctness of the cranial sutures, and of the coronal processes of the teeth; and, by comparison with the skulls of several mature and large specimens of the Sambur or Jarai, I find the skull of the above to exceed them in size in the proportion of about an eighth, whilst the horns surpass the finest specimens of those of the Sambur by two-fifths. The skull is further



us. Rusa.

Jurāi of Nepal.

rus nob.



Stag of the Saul forest
Cervus Affinis
 $\frac{2}{3}$ Nat Size



Chemalensis Rusa
 The Kato Jarai of Nepal
 $\frac{1}{4}$ Nat Size
C. Heterocerus nob.

distinguished from that of the Sambur, by greater elevation of the frontals, between the bases of the horns, and by a proportionally greater dip across the forehead above and between the orbits; by superior saliency of the orbits, and by their more advanced position in relation to the entire length of the skull; by broader nasals, less arched in their length; by wider intermaxillaries, leaving a larger nasal cavity; and, lastly, by suborbital pits of considerably less size. Of the Baraiya, again, the skull and horns, in proportional size, fall fully as much (and more) short of the present animal, as do those of the Sambur or continental type of Rusa; and if, in reference to such *details* as those just indicated, although there is more resemblance here than before to our subject in the frontal or cerebral portion of the cranium, there is even less in the facial portion, which is singularly compressed and attenuated. The horns of the Baraiya, by their pale hue and smooth surface, as well as by the more forward direction of the basal antler, and the greater reclination of the beam, more nearly approach those of our animal than do the horns of the Sambur. But still they differ by a vast interval in point of size,* as well as in the technical characters of having but one basal snag, no median, and several (four to five) terminal ones. All three skulls are distinguished by canine teeth; but they have no other similar and literal resemblance. Of *Cervus Wallichii*, I have no specimen either of the skull or of the horns; but I have a clear general recollection of the original specimen in the live state; and, with the utmost allowance for the (supposed) effects of decrepitude, I cannot perceive any means of thus soundly accounting for the deficient royal antler, or for the vast inferiority in size, nor, therefore, of identifying *Wallichii* with our present subject.

This animal, as it appears to me, very remarkably resembles the Stag of Europe in almost all the characters of the skull and of the horns, leaving indeed, as distinctive peculiarities, only superior size in the horns,† and the simple Sambur-like bifurcation of their tips. Greater age might possibly have given to our animal the full crown of

* The largest horns of the Baraiya I have measured, were but 34 to 36 inches long by the curve: nor are the largest Sambur horns longer; whereas the horns of our Stag measure no less than 54 in.

† H. Smith, apud Cuvier, gives the dimensions of the horns of a European Stag that were considered enormous; yet they fall short of the size of those of our animal.

snags distinguishing the Red Deer of Europe; and, if so, I should incline to my old opinion, and regard the difference between the two animals as merely a variety. But, on the other hand, the noble horns of our present subject seem so fully developed, and his age so far from juvenile immaturity, that we may reasonably suppose these horns to exhibit the normal form; and, in that case, the species will be distinct from *C. Elaphus*, and may be called *C. Affinis*, from its extreme affinity thereto. The pedicles are tolerably elevate; the burrs rather small; the two basal antlers of each beam of equal size, nearly straight, and so forward in direction as to overshadow the face to the end of the nasals: these basal antlers are larger than the royal, and even than the terminal antler, and are put off from the anterior side of the beam, one above the other, with an interval of about inches two and a half, the beam continuing as thick there as it is close above the burr, where the lower antler divaricates. Having put off these basal snags, the beam reclines considerably, and in the style of *Axis* thirteen inches, and then gives off the median snag from the antea aspect as before, but with a more upward direction. A foot higher is the terminal fork, the prongs of which radiate laterally and equally from each other, so that it is difficult to say which is the beam and which the antler; more especially as the inner prong (so to speak) of this fork is the longer, though slighter, and the outer one the thicker, though shorter. We now leave our "true Stag of the saul forest," or *Cervus Affinis, nob*, to the discretion of the European Master of Museum and Library. Specific character (?) *C. Affinis*, Stag of India, very closely affined to the Red Deer of Europe. Horns very ample, pale, smooth, rounded, having two basal antlers and one median directed forwards from each beam, but the crown simply forked as in *Rusa* and *Axis*; standing in a natural arrangement between *Elaphus* and *Wallichii*, but larger than either.

B. H. HODGSON.

Nepal, June, 1841.

Notes and Observations, in continuation, from Dr. WALKER, Madras Medical Service, on a tour in H. H. the Nizam's Territories.

On the evening of the 25th of April I left Chinnore, and reached Khummamait on the 3d of last month.

Until within thirty miles of Worungul, the sandstone remained the surface rock, but, at this point, the sienite appeared, with its characteristic tors and logging stones, and continued so all the way to Khummum. The various trees mentioned in former reports were seen in abundance, particularly in the sandstone country, the greater portion of which is covered by them, forming, in many parts, a dense forest. The granitic country, on the other hand, although sufficiently well wooded, is, throughout, a much more open country, the tree vegetation being neither so various, nor so luxuriant, as that of the former.

The Circar of Khummamait, differs in scarcely any of its cultivated productions from that of Worungul. The dry grains and legumes of both are identical, and there is scarcely a variety of rice cultivated in the one, that is not grown in the other. Of the garden produce, Turmeric alone, (*Curcuma Longa*,) would appear to be exclusively cultivated at Khummum.

Mineral productions.—Iron ore, of the kind mentioned in the first report, occurs in the neighbourhood of Khummum, even more abundantly than at Hunnumkoondah. In preparing the iron, the great fault observed in the process, is, the little care bestowed in pounding the ore; the workmen, instead of reducing it to a fine powder, as is done in Sweden, content themselves by breaking it into pieces about the size of a hazel nut. Much additional labour, and an unnecessary expenditure of fuel, are the consequences of this error.

The garnet mines of Gopulrowpet, described by Dr. Voysey, are situated to the north-east of Khummum, towards the Godavery, distant about seventy miles. According to his description, which would appear to be found in the alluvium, composed of the debris of a rock of garnetic granite; specimens are sent of the garnets; which are mined and exported in their rough state to Hydrabad on the Coast, where they are cut.

Animal productions.—A considerable quantity of deer and buffalo's horns, the former brought from the jungles, is sent from Khum-

mum; their usual price there being about a pice each; the wool produced is manufactured into *cumbuls*, which are also exported. The demand for hides, for agricultural purposes, in the Circar is quite equal to the supply.

The *Mylabris Cichorei*, possessing blistering powers superior to those of the Spanish fly imported from Europe, is abundant throughout the granitic country, from the middle of June till December, and may be gathered for about a rupee a pound.

Vegetable productions.—The *Sansevieria Zeylanica*, the *Ishnia Codanar* of the Telingas, and the *bowstring hemp* of Roxburgh, is a very abundant production, both in the Worungul and the Khummum Circars. Its useful properties are unknown to the natives, who turn it to no account. Dr. Roxburgh proposed the cultivation of this plant for the hemp which it affords, and the strength and tenacity of its fibres, rivalling, which if not excelling, those of its congener and closest ally, the *Phormium Tenax*, (New Zealand flax,) render it remarkable that his proposal should never have been, as far as I am aware, adopted. It is probable, however, that the proneness to nip and rot, when exposed to moisture, is common to the fibres of all monocotyledonous plants; should such be the case, we must prefer seeking for hemp plants in the exogenous class. In addition to the medicinal plants mentioned in the former report, I may here add the *Cucumis Colocynthis*, the true Colocynth, the *Asclepias Asthmatica*, the country Ipecachuana, the *Ipomoea Cœrulea*, the seeds of which have been proposed by Dr. O'Shaughnessy as a substitute for Jalap,—all common plants, and also the *Cæsalpinia Bonduca*, *Gentiana Verticillata*, and some other medicinal plants less known and appreciated,—as several species of *Euphorbiæ* and *Asclepias*, the *Aschynomene grandiflora*, *Pavetta Indica*, &c.

Manufactures, &c.—Calico printing is practised at Khummum; but it would appear to be a feeble off-set from the art pursued at Madappollam and Masulipatam, from whence the printers have originally come. The printing is confined to two colours, black and red; the former obtained from a mixture of gum, myrobolan, and sulphate of iron; the latter from the root of the *Morinda Citrifolia*. The printing blocks, composed of teak-wood, are procured from Masulipatam, and there is little variety or beauty in the patterns; the cloths printed are usually coarse surrhees and handkerchiefs. Hand-fans from the leaf of the

Borassus Flabelliformis are manufactured at Khummmum, and also a coarse kind of toys. Two of the exports from this Circar are rather remarkable; viz. plates from the leaves of the Pallas tree, (*Butea Frondosa*,) which are sent to the Coast, and kingfisher's feathers, which are purchased by Burmese agents, to be sent to Ava.

Having brought to a conclusion all the information I have been able to collect, regarding the productions of the three Circars of Worungul or Hunnumkoonda, Chinnore or Ramghur, and Khummmum, I shall now proceed to give some general observations on the inhabitants, their conditions and diseases, communications, &c. Although, strictly speaking, what follows is applicable to that part of Telingana which is included in a triangle having a point on the Purmeetah river, a few miles north of Sevoucha, for its apex, and a line drawn from Hyderabad to Khummmum for its base, yet the greater number of the remarks will be found applicable to a much more extensive range of that country.

The natural division of this country is into the sandstone and granitic. The former is composed of a belt, of various extent, on each side of the Godavery, while the latter is the great formation of the country. Considering how much the causes that modify or determine the character of a people depend on the geological structure of the country they inhabit, I think it as well to state this division *in limine*, as I shall have frequent occasion to refer to it. I regret that I cannot give a very accurate account of the breadth or extent of the former, but, in the plain which I visited to the south of the Godavery, its depth was from twenty to fifty miles from the river, although in many parts it sends out processes covering the granite to a much greater distance.

Inhabitants.—The great majority of inhabitants, perhaps three-fourths of the whole, is composed of Telingana peasantry. This class is readily known by their spare form, dark complexion, and a certain air of subjection impressed by their occupation. They appear a contented race, with less spirit and enterprize than the Mahratta cultivator, but superior to the Bengalee in courage and activity, as is proved by their reputation in the ranks of the Madras army. The indifference to better their condition, and to rise in the world, common to agriculturists in most parts of the world, is fully possessed by the ryots of Telingana.

Brahmins.—If we are to judge of this puzzling caste by common tests, there is much reason, from the striking diversity of feature and

complexion, to pronounce the Telingana Brahmins a mixed race. The *poojarees* wear no turbans, and daub their countenances with paint to a much greater extent than is the custom to the westward. Many Zemindars are Brahmins.

Aylmas.—This is a caste peculiar to Telingana; they affect for themselves a high descent, which however is denied by the other castes, who assert that the *bhaats* (bards) sung them into repute from a very humble origin; they are respected and feared throughout the country, as gallant soldiers, and dangerous enemies. They seclude their women, a practice in all probability derived from the Moosulmans, and which would seem to give countenance to their being but newly sprung up. Several of the Khummumait and Worgungul Zemindars are of this caste; they are a well-made, rather a good-looking, set of men, very fond of the chase and of all active exercises.

Mahomedans.—With the exception of troops, Government employés, and a few tradesmen, there is scarcely a Moosulman in the Telingana country. I, of course, leave the city of Hydrabad out of the question.

Bedurs.—This race, or rather tribe, is found chiefly in the Chinnore Circar, where they take the place of the *Dhurs*, and act as a sort of Gibeonites to the Brahmins and higher castes. Their chief, it is well known, resides at Shorapoor; they are an industrious, contented class, of a darker hue, perhaps, than the Telingana *Coombees*, but with scarcely any other distinguishing mark.

Goands.—It has been customary to consider this people as the aborigines of India: If, by this, it is meant that, as far as records go, they have been what they now are, there is little to be objected to the term, although one that is less decisive ought, in our ignorance, to be applied; but, if it is assumed from any fancied absolute difference in their physical appearance from the inhabitants of the plain or cultivated districts, it is positively to be rejected, as leading to error. It is said that they are a dwarfed, stunted race; but an under-fed, oppressed people, with limited resources, will become so in the course of a few generations. Their not professing Hindooism is surely, with the history of religion before us, no argument that they must be necessarily distinct and separate; nor is their peculiar language (if peculiar it be) a better proof. None of the marked distinctions of form, feature, shape of head, character of hair, by which different races are characterized,

are observed to exist between the Goands and the Telingee cultivators.

The *Goands* are to be found wherever there are hills and fastnesses, but they abound most in the north and east of the Khummum and Ramghur Circars; although a wild uncultivated race that have scarcely advanced a step towards civilization, as is shewn by their non-association in villages. The Telinga *Goands* are not, like the wild tribes towards the north, addicted to cannibalism; good faith and treatment render them tractable and submissive, and would doubtless turn their labour to profit, did circumstances demand it. *Dhurs*, the Telinga *Dhur*, is a despised impure creature. Foreign war and domestic dissension, which, by conferring intelligence, have given some importance to this class in other parts of India, having been wanting in Telingana for centuries, the race has remained in its present state of degradation and moral slavery.

Dwellings.—A Telingana village presents a striking contrast to a Mahratta one; instead of the close flat-roofed habitations of the latter, huddled together, so as to take up the smallest possible space, the greater number of the houses of the former are separate, or, what is called, self-contained. The Gurrie in the Mahratta country which includes, generally speaking, all the houses of the village, is in Telingana a detached fortification of some fifty yards square, composed of masonry and mud, seldom having within its enceinte any houses save that of the zemindar or village chief. In the granitic country, the houses are usually of adhesive earth, of a square or rectangular form, smeared often with red earth, and tricked out with bands of chunam, (the sign of comparative comfort and cleanliness within,) with pyramidal roofs of palmyra leaves or grass. On some occasions the houses are more substantially built, and are tiled; on others, they are mere sheds of palmyra leaves, marking the richer and poorer classes as occupants. The Dherwarra, always detached, and always filthy, is composed of habitations of the latter class.

In the sandstone country, the construction of the houses is different. From the inferior tenacity of the soil it is mostly rejected in building, or, when employed, is mined from the localities where it is ferruginous, and more adhesive. Bamboo and wattle are there the principal substitute for clay in the houses, and the strong-holds are con-

structed of hewn stone ; the labour required in rendering the last tenable, diminishes in no ordinary degree their number, although it may render the few that are constructed more formidable as places of defence.

Food.—The Brahmins of Telingana affect to eat nothing that ever was possessed of life, but report attributes to them any thing but a strict fulfilment of their profession. Their usual diet consists of rice highly seasoned, vegetable curries, cakes flavoured with garlic and asafoetida fried in ghee, wheaten bread, &c. ; with the assistance of the ghee, flour, and condiments, they take good care to avoid the evil consequences said to arise from an unazotized diet. The food of the Zemindars of the *Coombee* caste, resembles that of the Brahmins, with the addition of mutton, fowl, game, &c. The poverty of the cultivators restricts their diet to dry grains ; leguminosæ being within the reach of few, and that only in particular districts. This arises not from the higher price of equal quantities of rice and dry grains, but from the little nourishment yielded by the latter, rendering it a more expensive article of diet. It is only on occasions of festivals or merry-makings that they eat flesh, and (duhee, curdled milk) is also a very common article of diet among the poorer classes. The *Goands* and outcastes, as elsewhere, are wholly without scruples as to their diet, rejecting nothing, whether animal or vegetable, that can be digested by the stomach, and which is not actually poisonous.

Drinking the fermented sap of the palmyra tree, often to intoxication, is the invariable daily custom of the Telingana peasants. Towards Chinnore and Mahdapore, the palmyra tree is not so common, but is then much more detrimental. Matwa spirit, distilled from the flowers of the *Bassia Latifolia*, a common jungle tree, is had very cheap, and in consequence is much used. Brahmins are charged with partaking of both these forbidden beverages in secret, and perhaps with truth, for it would require a more heroic virtue than they are supposed to be possessed of, to keep them from an indulgence so readily procured, and the effects of which, a very ordinary degree of caution can conceal. Tobacco is used by all classes, being smoked and snuffed. Little *bhong*, or any of its preparations, and less opium, are consumed by the Telingas ; but the Goands indulge, as far as their means will permit, in the latter, to which they are much addicted.

DISEASES.

Fever.—Fever, of the intermittent and remittent types, are met with throughout the whole country, particularly at the close of the monsoons, and for six weeks afterwards; they are not very formidable diseases in the open granitic country, but in the neighbourhood of thick jungles, their severity is much augmented; in the sandstone district there is a good deal of fever in the course of the monsoon, from the great facility with which the soil parts with moisture by evaporation, thereby generating malaria; and here it may be remarked, that the superior drying quality of the sandstone soil over the granitic, is by no means a circumstance favourable to the salubrity of the former. A few days of an October's sun effects its desiccation, and sends up an evaporation loaded with impurity, at a time when the malarian influence is at its height, and when the human frame, weakened by the return of heat, is little adapted to resist its action. The fevers are then of a severe, and often a fatal character, to which the spirit-drinking of the mass of the inhabitants contributes in no small degree.

Spleen.—This disease exists on the banks of the Godavery, after its union with the Purneeta river, and all along the banks of the latter. At Sevoncha it is particularly severe; being attributed by the natives to drinking the impure water of the rivers, for the great depth before water is reached in digging, almost amounts to a preventive to their employing any other.

Cholera.—Compared with other parts of India, cholera cannot be said to be a very prevalent disease in Telingana. For the last eight years it has not appeared epidemically, and, on that occasion, it followed as a consequence of a severe dearth. It is held in great dread by the inhabitants. Leprosy and Elephantiasis, in all their horrid and disgusting shapes, are frequently met with.

Eye complaints.—Diseases affecting the globe of the eye, particularly ulcers of the cornea, albugo, and other consequences of ophthalmia and cataract, are common, especially in the sandstone districts. From what came under my observation, I should say, that affections of the eye appendages are rare.

Dracunculus.—This singular and troublesome disease is met with, in a greater or less degree, all over the country. At Chinnore it is less prevalent than at Worungul, and at Worungul less than at Khummum, which

would appear to be its head-quarters. The natives universally ascribe it to the use of well-water, whether in drinking or bathing; although their explanation of how this happens is not probably correct, from many observations I have made, both here and in the Bombay presidency, I think their opinion is so far well-founded, that when the supply of water is dependent on wells sunk in a decaying rock, whether of granitic or trap, in other words in *Mohrum*, *Dracunculus* is almost certain to exist. There is seldom a body of men who are so similarly situated with respect to diet, exercise, clothing, &c. as European soldiers, yet I have known one-third of a European Regiment, which was indebted solely to wells for its drinking water, laid up with Guinea worm, at the same station with another which used aqueduct water, in which there was not above six or eight cases. The situation, too, of the Telinga cultivators, in the Circars of Khummum and Worungul, is remarkably alike; yet for one case of *Dracunculus* at Worungul, there are four at Khummum, the former deriving their chief supply of water from tanks, while the latter depend solely on their wells, which are sunk in a loose rock. The natives allege, that this disease is acquired by the germ entering the body while bathing at the wells, and that the greater latitude afforded by tanks for washing, diminishes the chances of the worm getting access to the body; but the rare ablution of the European soldiery, who are fully as liable as the natives to this disease, disproves their manner of accounting for the complaint.

The native *hakeems* are, for the most part, Brahmins; their great standby in fever is starvation, and were this means of cure used with moderation, it might be productive of good; but it is pushed sometimes to such an extremity as to cause death from sheer inanition. Opium is given in Cholera, but from the great nicety required in administering the drug in this disease, I should fancy they did as much harm as good with it. They have a proverb for the treatment of Guinea worm, "*Ek naroo huzar dawas*," for one worm there are a hundred remedies; which pretty clearly shews that the much-vaunted native practice in this disease is not so successful as some have represented.

The Surgery is in the hands of the *hujjams*, whose universal cure would seem to be the actual cautery. I have heard of the operation of cataract being performed, but have not had an opportunity of seeing either the operator or his tools. The *hakeems* have their books

of medicine, with the characters written, or rather scratched, on palmyra leaves.

With regard to the most eligible spot for cantoning troops, there are several in the granitic country that would answer the purpose, being salubrious and well situated for supplies, &c. The following circumstances, when grouped together, point out a locality well adapted for this purpose. A red, gritty soil; the neighbourhood of a clear tank; and the country around open and unbroken. The vicinity of a black granitic hill, adding as it does much to the heat of a station, should be avoided: above all, let the troops be independent of wells for a supply of water, for besides its almost constant bitterness, it will bring on Guinea worm, than which no disease can more effectually cripple or render them inefficient. More difficulty would be experienced in fixing a locality for this purpose in the sandstone country. There is no point, after the junction of the Godavery and Purneetah, that can be regarded as salubrious during the latter part of the monsoon, and for weeks after. Madhapore, a village ten miles below the Sungum, where a detachment of the Nizam's troops was at one period cantoned, was found to be very unhealthy at certain times; nor can this excite our surprize, situated as it is between a dense jungle, and the slough and ooze of a muddy river. Chinnore, ten miles above the Sungum, would seem to promise better, the jungle there not being so dense, the river clearer, of much smaller compass, and at a greater distance; while the ground also rises somewhat towards the town.

The Brahmin village of Muntini, still higher up the Godavery, would seem preferable to Chinnore in point of salubrity; but other considerations would, in all probability, fix on the latter as the more eligible position of the two, for troops to be stationed.

Communications.—The road from Masulipatam to Hyderabad skirts the Circar of Khummum to the south. It is a good road, although liable, as every other in the Peninsula is, to be cut up by flood during the monsoon. The red soil is well fitted for road-making, becoming bound and hard when stamped or trod upon. The black soil is, as elsewhere, less so, but its extent in many parts of Telingana is such, that it might in a great measure, be avoided, in the construction of roads. With the exception of the one above-mentioned, there is no other communication of the kind in Telingana, for it would be a misnomer to apply the term to the rude, unmade paths of the

country. In the Chinnore Circar, carts are a very ordinary mode of conveyance, and, as timber is abundant, and iron procured at comparatively a small cost, they are more substantial and better built than in many other parts of India. In the other two Circars, carriage bullocks are almost wholly employed, to the exclusion of carts.

With the exceptions of the Godavery, and the stream sent from the Pakhall Lake to the Kistna, there is no permanent running water in those parts. The latter, although deep, has scarcely width enough to be turned to account as an avenue of commerce; but the Godavery is, with some impediments which would seem removable by art, a navigable river from June till February. I have conversed with more than one individual, who has sailed down the river from Chinnore to Bhudrachellum in three days, from which to the sea, at Coringa, no great obstacle offers itself. Captain Fenwick, late of the Nizam's service, from whom I have derived the greater part of the information respecting the Godavery that I have now the honour of communicating, and who had ample opportunities of making correct and extensive observations, having frequently sailed down the stream, says, "From Coringa to Bhudrachellum the navigation is perfectly free, except that there is a whirlpool, or *papee condul*, not far above Palaverum, at the opening of the narrow and tortuous straits of the same name, which wind through a range of high hills for more than twelve or fifteen miles, commencing from the Nizam's boundary. The river here is generally not more than 300 yards wide. In some places, I think even less. The mountains rise almost perpendicularly from the water's edge, and the depth is many fathoms."

From Bhudrachellum to Ellapoka, the river is impeded by rocks when it is low; but when half full or more, there is difficulty in the navigation. The same description applies to the rocks marked at Chentral, Doonurgoovum, and Albaka; from the last point the river, although quite free, is somewhat shallow, early after the rains. The next obstacle is the two whirlpools at Mooknoor, which, when the river is full, present a considerable obstacle, but not so when it is moderately full, at which time the boatmen, who are very expert, manage to steer between them without danger. The passage between Nulumpully and Mooknoor is only tedious after the rains, as during the freshes the rocks may be sailed over. The last obstacle in the Godavery is just at the

junction of the Indaroottee. The channel through the rocks, which are there high, is very narrow, and pointed ones in it render the passage somewhat dangerous. "Some of these," adds Captain Fenwick, "I had removed; the nature of the rock being soft slate."

From the junction of the Indarooke to the Purneetah, not a pebble is met with, and the Purneetah itself, which contains at least double the water of the Godavery at Chinnore, is without impediment of any kind up to Coorta. The rocks there and at Dharoor are only formidable when the river is low; above these, there is no obstacle as far as Churchmundel above Woone, where the rocks are formidable, if not insurmountable obstructions.

The map of the Godavery and Purneetah accompanying this letter, is copied partly from maps procured from the Residency, and partly from plans sent by Captain Fenwick, drawn up from his own experience.

The boats of the Godavery are miserable canoes, hollowed out of the trunk of a single teak-tree. Two are often joined together by means of a raft of bamboos, particularly for the purpose of ferrying; they are without sails or fixed rudders.

I cannot conclude these letters without bearing testimony to the comfort and happiness which the natives of these districts appear to enjoy. The short period I spent in the country could not afford me many opportunities of inquiring minutely into the circumstances, or of making very extensive observations; but there are signs of general prosperity, particularly in the Circars of Worungul and Khummum, that he who runs may read; of these I may mention the frequent occurrence of silver ornaments among the wives and children of the *Coombees*, and the rare circumstance of a ruined tank; nor can I omit to mention the kindness of Mr. Wighton, who afforded me every facility and assistance in his power, in fulfilling the purpose for which I had been sent to the districts.

A general Review of the Species of true Stag, or Elaphoid form of Cervus, comprising those more immediately related to the Red Deer of Europe. By EDWARD BLYTH, Curator of the Museum of the Bengal Asiatic Society.

Of the various minor groups distinguishable in the great genus of the Deer (*Cervus*, Lin.), a very obvious one is exemplified by the European Stag (*C. Elaphus*, Lin.), or Red Deer of Britain, to which the Greek word *Ελαφο* has hitherto been specifically attached; and it is accordingly known as the *Elaphine* group of Colonel Hamilton Smith, or that of the Stags, properly so called. It consists of several large, powerful, and comparatively long-bodied species, with cylindrical antlers,* bearing many tines or branches, and a short tail surrounded by a pale disk. The males of them, and occasionally, I believe, the females also, are furnished with upper canine teeth. Their coat is more or less harsh, tubular, and spongy, and conceals in winter much delicately fine wool; being in the young speckled, or *menilled*, with white, as in most, but not all, other *Cervi*; which spotting disappears with the first shedding of the hair, except, in some, a row along each side of the spine, which however are considerably obscured, though there is again a tendency in some species to resume the spots in summer livery, which is always more or less rufous (as in most other Deer), that of winter being generally darker, especially on the neck, limbs, and under-parts, and the female being mostly paler than the male. The most peculiar character, however, of this group, though it nevertheless does not occur in all the species which strictly pertain to it, consists in the normal presence of a second basal tine to the antlers (*vide* plate,—fig. 3, *b*.) which occurs normally in no other species of the family: these two basal tines are denominated, in books on “*venerie*,” the “brow antler” (*a*), and the “bez-antler” (*b*); for the word “antler” referred to the principal tines, or branches, and not to the entire

* In conformity with the practice of some recent naturalists, I apply this term to the *deciduous* horns of the Deer family, as distinguished from those of other horned ruminants, which are borne permanently, and have their bony core invested by a cuticular or corneous sheath, likewise persistent, after having been (at least the softer external layer) once shed in the young animal, and which partly corresponds to the *velvet*, or hairy skin, of a growing Stag's antler, that withers and shreds off when the vessels it encloses are obstructed by the final deposition of bone, forming the *burr*, or basal ring.

production, which may be more conveniently distinguished by that appellation. A third tine (*c*) is given off midway up the beam, which was termed the "royal" antler; and the ramifying summit of the beam (*d*), was styled the "crown," or "surroyal." I shall simply designate them as the *first and second basal tines* (*a, b*), the *medial* (*c*), and the *crown*; and may remark, that in the European and some other species, the last assumes a more characteristic form than in the generality of Wapiti Stag's antlers, (the species represented,) being generally trifid (as in fig. 3, *d*), with a disposition to subdivide further, more particularly shewn by the innermost and hindward of the three coronal prongs that issue from a common centre, and which is always longest, imparting a lyrate curvature to the entire pair of antlers when viewed in front.

These noble and picturesque animals are gregarious, and frequent extensive moorlands, interspersed with bog and forest, more particularly on the lower ranges of mountains, where indeed such tracts usually occur. In general, or with some modifications, the habits of the British Red Deer may be presumed to illustrate those of all the other species; the gigantic Wapiti, perhaps, differing most in its monogamous inclination, which, it may be, the nearly allied Jerrael Stag (*C. Wallichii*), of middle Asia, likewise evinces. The geographical range of the group extends to both continents, but is confined to the northern hemisphere; and, with the sole reported exception of the Jerrael, upon the mountainous interior of the Burmese territory, to the northern temperate zone; with one established exception, however, they belong to the eastern continent.

The American species, denominated the Wapiti (*C. Canadensis*, Gmelin, *C. Strongyloceros*, Schreber), or "Elk" of the Anglo-Americans, by whom the true Elk (or *Alces* of Cæsar) is termed *Moose*,* is

* The frequent mal-appropriation of vernacular names, such as is here noticed, and which is a great deal too much encouraged by writers on Zoology, leads to continual misunderstanding and mistakes, of which an instance is now before me, in the description of the true Elk, published in the Naturalist's Library, where an anecdote related by Major Long and Mr. Say, referring to the Wapiti under its false name of Elk, is assigned to the species properly so called. In South America, the same appellation, Elk, is bestowed on the *Cervus Paludosus*; in India, on the Sambur, *C. Hippelaphus*; in the Malayan territories, on the *C. Equinus*; and finally, in South Africa, the Caffrarian Impoof (a sheath-horned ruminant) is designated *Elk*, *Eland*, or *Eland-bok*. "*Eland*" is the Swedish term for the true Elk, and signifies *miserable*; in allusion, no doubt, to the extremely plaintive and dolorous cry emitted by this animal, rather than to its being subject, as alleged, to frequent fits of epilepsy, which has been suggested to have induced the application of such a name.

a great imposing animal, the largest (so far as known) of the whole group; and it would appear to exemplify a subordinate section of the Stags, characterized generally by large stature, a heavier and less compact build, shorter tail, and enlarged white disk surrounding it; the head borne low and horizontally, with the neck much bowed, as in a Camel; and the crown of the antlers assuming generally a different form from that of the others, very seldom trifurcating (so far at least as my experience has gone), but the continuation of the beam usually turning abruptly backward and downward, and throwing up a series of successively diminishing tines, all nearly in a line with each other (vide Plate, fig. 4). Of a very considerable number of full grown Wapiti antlers, I have seen but one pair whereof the crown decidedly trifurcated (as in fig. 3); and have remarked that many had the second basal tine longer than the first, which however is abnormal, and also that the greater number had a snag (fig. 3, *c*.) near the origin of the two basal tines, which is of rare occurrence in the European and what other species I have had opportunities of examining.

The Wapiti stands four feet and three quarters to five feet and upwards high at the shoulders, with towering antlers, sometimes above five feet in length, though they rarely much exceed four feet; they are often a foot round at base above the burr, and eight inches in the beam; the pair diverging more or less, but sweeping round till they converge towards the extremities, as in the genus generally. An unusually large male, killed by the hunters attached to the expedition of Messrs. Lewis and Clark, was found "on placing it in its natural erect position, to measure five feet and a quarter from point of hoof to shoulder;" but the curve of the body is probably here included, which would add some inches to the alleged height of so large a creature. It is certain that they do not generally attain to so much as five feet high, and the female to more than four feet and a half. The head of the male measures fifteen inches from muzzle to base of antler; the ears nine inches; tail four inches, or, with hair, five; and from nose to base of tail, in a specimen four feet and three quarters high, eight feet ten inches. This large species (of which magnificent specimens are now living in England, in the Zoological Gardens and elsewhere,) has an aspect of much grandeur and stateliness, but is deficient in the grace of its European relative; being considerably more massive and

ponderous, with stouter limbs, shorter in proportion, and terminated by broader and more ox-like hoofs; at least the inner hoof of their cleft fore-feet (more especially) is much widened. The full grown male, in winter more particularly, has a peculiar character in a sort of beard pendent from the throat, in aspect not unlike a dewlap; besides which, as in the European species, the hair is in winter lengthened around the neck, only not so coarse as in that animal. The summer hue of both sexes is very bright rufous, darker on the head and neck; and the male is seldom without some appearance of the throat beard, though his neck becomes quite smooth; in the course of a few weeks only, the tips of the hairs begin to fall off, and the colouring is thus rendered nearly similar to that of winter, save that the hues are much less finely brought out; at which latter season the Wapiti is clad with longer hair, of a pale lilac-chocolate colour, approaching to whitish in fine males, with the limbs, lower part of the neck, and under-parts, dark and deep russet brown; colours which are not so intensely contrasted in the females and younger males. The fawn is but slightly menilled on the sides, and it is remarkable that there is no trace of the usual row of large spots on each side of the dorsal line, which alone are permanent in the European Stag. Whether the same is observable in the young of other species of this group, I have not now the means of ascertaining. The general colour of the Wapiti fawn is deep rufous brown, fainter on the sides, and still more so on the under-parts, (whereas the adults are there darker); the face, the neck partly, and immediately above the hoofs, being much darker; a black line passes along the back, and there is a streak of the same, as usual, over each eye. The characteristic expression of its species is strongly marked from the first. They do not acquire their full growth under four or five years at least, (like the European Stag); but, as in the rest of the genus, can propagate at eighteen months old. Mr. Bullock states, that one five years of age stood four feet and a half high, and was nine feet in total length. These younger Wapiti have more the aspect of the European species, and, like the female, shew little trace of the throat-beard, nor have they much lengthened hair round the neck. The fully adult female more resembles the European hind, than is the case with the mature males of these species, with all their distinctive characters fully developed. At the same time, I have observed that some European Stags have

decidedly more the contour of the Wapiti than others, being lower upon, and not so fine in the limbs; as is well exemplified by two Common Stags that were living in the Zoological Gardens, Regent's Park, at the time I left London, near the end of April, 1841.

The full grown Wapiti, like other true Stags, sheds its antlers either late in February, or (the majority) during March: in less than a month, the new have attained a foot in length, and continue to grow with surprising rapidity, at one time, above an inch and a half per day; but the growth slackens as they advance towards completion and solidify, being not finished before August; the velvet shreds off in September, when the rutting epoch commences, and lasts through the following month; the period of gestation is rather more than eight months, (as I was informed at the Zoological Society's Garden, and not so much as nine months, as has been asserted); being about the same, accordingly, as that of the European hind; and the young, either one or (in the wild state) commonly two in number, and in case of twins (which would appear to happen much oftener than in the British Red Deer) generally male and female, being accordingly dropped—a few at the end of May, but the majority in June. Colonel Smith noticed, that the medial and basal tines of the antlers of this species “seem to be instruments of use; for, with them, when a small dead pine, or a bar of a split fence, sixteen or eighteen feet long, lies in their way, they will lift and toss it clear over their heads.” Possessing these appendages, they make such incidental use of them; but we are not to suppose that their antlers were designed for purposes of this kind.

The wild Wapiti, notwithstanding its great size, is as timorous as any other Deer; except, as usual, during the rutting excitement, when it is dangerous to approach the males. It inhabits the greater part of North America, but “does not extend its range,” according to Dr. Richardson, “further to the north than the 56th or 57th degree of latitude, nor (in the fur countries) is it found to the eastward of a line drawn from the south end of Lake Winnipeg to the Saskatchewan, in the 103d degree of longitude, and from thence till it reaches the Elk River, in the 111th degree. To the south of Lake Winnipeg, it may perhaps extend further to the eastward.” Messrs. Lewis and Clark, in their arduous expedition to the source of the Missouri, and thence to the shore, of the Pacific, encountered the Wapiti in considerable

abundance nearly throughout their route, and pretty high up the mountains; and they state it to be "common in every part of the country, as well in the timbered lands as in the plains, though much more numerous in the former." Hunter, in the interesting "Memoirs" of his youth, passed among different (so called) Indian tribes, asserts that "they are small, far south, but increase in size in the neighbourhood of the mountains." He also mentions, that they are very large about the Columbia. In the States, the distribution eastward of this species is limited by the settlements, in the vicinity of which it fast disappears as they become populous; having been extirpated more than a dozen years in Illinois,* while Dr. Godman (in 1826) writes, that "it is still occasionally found in the remote and thinly settled parts of Pennsylvania, but the number is small; and it is only in the western wilds that they occur in considerable herds."†

Dr. Richardson describes this species to be "pretty numerous amongst the clumps of wood that skirt the plains of the Saskatchewan, where they live in small families of six or seven individuals:" the males, according to Dr. Harlan, attaching themselves to the females, and the members of each troop being strongly united. Colonel Smith also mentions, that "they are said to live in small families of six or seven individuals, headed by an old male, who is reported to be monogamous; the rest, besides the hind, being calves or semi-adults." I have met with no account of the sexes ever herding separately: but Hearne asserts, that "they generally keep in large herds, and, when they find plenty of pasture, remain a long time in one place;" so, also, Umfreville relates, of his "Red Deer," which is clearly this species, though *C. Virginianus* is often so termed in the States, "They are very common in all parts of the country, and they assemble in herds; it is not unusual to find 500 or 600 of them in a place; but they are not to be met with on the open plains, where the Buffaloes [American Bisons‡] resort." The same is noticed in Keating's "Narrative of an

* Featherstonehough's Journal.

† American Natural History.

‡ The term *Buffalo* is often vaguely applied by persons not naturalists, to any animal bearing a general resemblance to an Ox, but which is obviously distinct from an Ox. Thus, when English graziers talk of having seen a Buffalo, it will generally be found that the large or Brahminee breed of Zebus, or Indian humped cattle, is intended; and in North America the Bison of that continent is thus termed (as above

Expedition to the source of St. Peter's River ;" but Lewis and Clark occasionally observed them upon the same plains with the Bisons, as in page 82 of their work, where it is stated, that "fifty-two herds of Buffalo, and three of Elk [Wapiti] were counted at a single view!" I have been informed, however, by a gentleman who has travelled much in the western regions of North America, that they never associate with the Bisons, and it is very rarely that both species may be seen at one view : though Catesby asserts, that "they usually accompany Buffaloes, with which they [did, in his time,] range in the upper and remote parts of Carolina, where," he remarks, "as well as in the other colonies, they are improperly called Elk." Keating mentions "a herd of fifty or sixty Elk," which some of his people "approached on horse-back, as near as they could, without alarming them, when the party dismounted, and crept for about a quarter of a mile on their hands and knees, leading their horses until they came within eighty yards, when they all fired, and one of the herd fell. A member of the party then mounted his horse, and pursued the herd for more than a mile, but his horse was too much alarmed by their appearance to be urged on near enough to allow pistol-shot to take effect. While in pursuit of them, he observed the Elk in the rear would frequently stop to look at him [standing at gaze, as it is termed, like all other ruminants]. When in herds they are easily overtaken, but when they are alone it is much more difficult. This animal is represented, however, as short-winded."*

noticed), which, inhabiting the same region with the so-called Indians, is sometimes even worse styled—the Indian Buffalo. In India, the word *Bison* is, in like manner, attached to a species which is not a Bison, namely, the Gaour, (*Bos Gaurus*) ; and Capt. Lyon mentions three distinct species of animals inhabiting the mountains to the south of Fezzan, all of which he erroneously calls Buffaloes, though two at least of them are not even Bovine. Those who write on subjects of Natural History should be more definite in their choice of vernacular appellations than has hitherto been customary, at least in the English language, and in time such errors may be eradicated ; though not before the city of *Buffalo*, in North America, and the *Elk River* (so named from the number of Wapiti Stags, not Elks, that are found on its banks), have perpetuated the memory of them in these established denominations. The name Buffalo derives from the term *Bubalus* of the ancients, which was applied to the true Indian species ; otherwise, it has been remarked, on the subject of purely fortuitous coincidences of the kind, a legitimate derivation would have seemed to occur in *Bœuf à l'eau* !

* Keating's "Narrative" vol. ii, p. 1. "A large herd of Elk" is also mentioned in vol. i., p. 303 ; and I could cite other instances of Horses being much frightened at the sight of these creatures.

that the herds of Wapiti are made up by the aggregation of a number of distinct families, such as have been already noticed, the individuals of which know each other, and keep together; for this is the case in many gregarious animals, and I have observed that, in the common Fallow Deer of English Parks, the sexes of which herd separately during the summer, particular individuals of the same age occasionally evince a friendship for each other, and always feed together, which partiality is resumed, by the same individuals, season after season. In like manner, herds of domestic Oxen commonly separate, or rather resolve into pairs; and the advantage of always stalling such pairs together is duly appreciated by English graziers, who find that their cattle are apt to pine, and not to fatten well when separated from the companion of their choice, in whose presence they appear to derive some consolation for the irksomeness of imprisonment.

The Wapiti Stag feeds much, like the European species, upon grass, and in like manner eats the young shoots of willow and poplar, as also "some buds of coniferous trees," according to Colonel Smith, who, from personal observation, adds that "in summer they feed on aquatic plants, which they seek under water, while sheltering themselves in that element from the bites of flies." It is worthy of notice, that the Rein Deer Gadfly, according to Captain Franklin, "infests the Wapiti, but not the Moose or Bison; nor have its larvæ ever been found upon the Wild Sheep or Goat of the Rocky Mountains, although the Rein Deer of those parts are as much tormented by them as those of the coast."* Kalm states, that this species feeds eagerly on the broad-leaved kalmia, "which is poisonous to other horned animals;" and Dr. Richardson describes them to be "very fond of the hips of the *Rosa blanda*, which forms much of the underwood in the districts which they frequent. Hearne," he continues, "remarks that they are the most stupid of the Deer kind, and frequently make a shrill whistling and quivering noise, not very unlike the braying of an Ass. Mr. Drummond, who saw many of these Deer in his journeys through the plains of the Saskatchewan, informs me, that it does not *bell*, like the Stag of Europe; and Mons. F. Cuvier describes the cry of the male as being prolonged and acute, and consisting of the successive sounds of *a, o, u*, (French,) uttered

* "Narrative of Second Expedition," p. 189.

with so much strength as to offend the ear. The cry of the European Stag, when compared to it, is dull and tame, though not deficient in strength." On one occasion I have remarked a cry, which, though not loud, corresponded otherwise with F. Cuvier's description, from an isolated female, which seemed to express *ennui*, or impatience of solitude: the only sound I have ever heard the male emit, is a disagreeable snuffling noise, expressive of menace, which it often makes during the rutting season. Dr. Richardson further adds, after Hearne, that "the flesh of the Wapiti is coarse, and but little prized by the natives, principally on account of its fat being hard like suet, [as, indeed, in all other *Cervidæ*, except the Elk.] It seemed to me to want the juiciness of venison, and to resemble dry, but small-grained beef. The hide, when made into leather, is said not to turn hard after being wet, and, in this respect, to excel Moose or Rein Deer leather."*

Dr. Godman remarks, that "the Wapiti is shy and retiring. The moment the air is tainted with the odour of his enemy, his head is raised with energy, his ears rapidly turn in every direction to catch the sound, and his large glistening eye expresses the most eager attention. Soon as the approaching hunter is fairly descried, the Elk bounds along for a few paces, as if trying his strength for flight, stops, turns half round, and scans his pursuer with a steady gaze; then, throwing back his lofty antlers, he springs from the ground and advances with a velocity that soon leaves the object of his dread far out of sight. In the rutting season, however, this animal assumes a more warlike and threatening aspect. He is neither so easily put to flight, nor can he be approached with impunity, although he may have been wounded. His hoofs and horns are then employed with full effect, and the lives of men and dogs are endangered by coming within his reach." An instance of this is recorded by Major Long and Mr. Say, wherein a wounded animal "turned furiously upon the foremost of his pursuers, who only saved himself by springing into a thicket, which was impassable to the Elk, whose enormous antlers becoming so entangled in the vines as to be covered to the tips, he was thus held fast and blindfolded, and was despatched without difficulty." It can only be wondered that such cases are not of much more frequent occurrence.

* *Fauna Americana-borealis*, and Hearne's Narrative.

The most nearly allied species to the Wapiti, I conceive to be the Jerräel Stag, (*C. Wallichii*, Duvaucel), a splendid Asiatic animal, hitherto only known in Europe from the coloured drawing transmitted by M. Duvaucel, and published by Mons. F. Cuvier. The following particulars are principally taken from a MS. description by the late Major-General Hardwicke, which, together with a bad coloured figure of the individual, I found among his papers deposited in the library of the British Museum. It doubtless refers to the identical specimen which was seen by Mr. Hodgson, and figured by M. Duvaucel, and the antlers of which are now before me in the Museum of the Asiatic Society: these, which are evidently the same as are figured in both drawings, I am enabled to state positively belonged to an animal in its third year, at which age it would by no means have attained its full growth; and the suggestion of my esteemed friend, Colonel Hamilton Smith, therefore, that it is doubtful whether the specimen was not aged, with declining antlers, I venture to negative without any hesitation.

This animal, according to General Hardwicke, stood four feet and a quarter high at the shoulder, and from muzzle to base of tail measured seven feet and a quarter; the tail five inches, surrounded by a disk nine inches square; head to vertex one foot five inches, and thence to shoulder two feet five inches; the ear, including its base, eleven inches. Hair on the ridge of the neck long, thick, and bushy, standing like a mane, and browner than the rest.* The prevalent colour a brownish ash, darkest along the dorsal line to the rump-patch, which is pure white, contrasting strongly with a blackish border, that merges without into the hue of the rest of the body. The limbs and under-parts are remarkable (more particularly as shewn by M. Duvaucel's figure) for being pale, whereas in other Stags these are darker than the body. Lips and chin white; the ears large and ovate, with a deep-sheathed base, and covered with whitish hairs; and the eyes large and surrounded by a whitish circle. The texture of the coat appears, from description, to resemble that of the Wapiti; and General Hardwicke states, that the animal "bowed down its neck in the manner of a Camel," *i. e.* the Wapiti, "and, when moving, carried its head very high, bringing the

* The whiteness of the antlers, as represented by M. Duvaucel, intimates that they were then about to be shed, and consequently the season at which the animal was figured, which was probably in the month of February or March.

front almost to a horizontal position. It was brought from Muktenauth, about five weeks journey from the valley of Nepâl, in a north-westerly direction ;” and the name *Cervus Wallichii*, I may remark, occurs in the interesting list of Mammalia inhabiting the Tenasserim provinces, prepared by the late unfortunate Dr. Helfer ;* though this alleged identification of the species much requires to be confirmed.

The pair of antlers in the Society’s collection are rather more than two feet long, following the curvature of the beam, five inches and a half round above the burr, and five inches immediately above the two basal tines ; each possesses these, and one of them has no further subdivision, while the other throws off what I cannot hesitate in considering to be a median tine, or “royal,” the bifurcation being 11 inches above the second basal tine, or “bez.” Mr. Hodgson, therefore, I feel satisfied, is incorrect in supposing that the Jerrâel has no median tine.† In the Gardens of the Zoological Society, there now exist (or did so, when I left England,) a fine pair, male and female, of the noble Persian Stag, or *Maral*, brought from that country, and presented to the Society, by Sir John McNeill. At the time of their arrival, the male bore his second pair of antlers, (what, however, are usually regarded as the first, though the true Stags, unlike the Fallow Deer, Axis, &c., develop a small knob, or “button,” as technically styled, the first year) ; this second pair consisted, as usual, of slender branchless beams, termed “brockets,” but the following year (1840) were replaced by a pair corresponding to those of the Jerrâel now before me, except that the median tine existed in both antlers. In the common European Stag, the second basal tine is ordinarily wanting at this age, but irregularities of the kind occur in every species : it is remarkable that the two basal tines of the young *Maral*, or Persian Stag, in the Zoological Gardens, were conjoined for a short space at base, but it remains to be ascertained whether this be a permanent character. In the Jerrâel’s antlers before me, there is an interval of an inch and a half in one of them, separating the two basal tines, the same as is generally noticeable in the European Stag ; while, in the Wapiti, this scarcely ever exists. For a figure of the pair, *vide* Plate, fig 7 ; and of those of the Persian species, sketched from

* *Vide Journal of the Asiatic Society of Bengal, for 1838, p. 897, et seq.*

† *Vide* Note to p. 721, *ante*.

memory only, though I venture to affirm not very inaccurately, vide fig. 10.

I now pass to a consideration of Mr. Hodgson's *C. Affinis*, represented in pl. —; and with all deference to that gentleman, I feel constrained to observe, that I can perceive no reason whatever why his animal should not be identified with *C. Wallichii*, as originally suggested by Mr. Ogilby, and accepted by myself on a former occasion. It appears to me, that Mr. Hodgson's specimen represents the animal in its fourth, or probably fifth, year; at apparently the former of which ages, there is a stuffed specimen of *C. Elaphus* in the Museum of the Zoological Society, with absolutely (so far as I can remember) the same flexure, or somewhat abrupt bend upwards about the middle of the beam, represented in Mr. Hodgson's sketch: the youth, or "moderate age," of this naturalist's specimen is attested, as he justly observes, by the condition of the teeth and cranial sutures; and I cannot doubt that, with full maturity, this noble species possesses a terminal crown to its antlers, assuming, thus, every feature of a typical member of the Elaphine group.

The Jerräel, probably, extends its range widely over the Chinese empire; and it may be presumed to be the "great Stag" mentioned by geographers upon the ranges of the Altai. Such is indicated in Strahlenberg's work on the northern and eastern parts of Europe and Asia, (p. 371, English translation,) as the *Irbisch*, or great Stag of Siberia, which inhabits that vast region, in addition to the *Isubrissen*, or common Stag; the *Suchata*, or Elk; *Olen*, or Rein Deer; *Cosa*, or Roe, &c. Whether it be identical with the Kashmir Stag of my friend Mr. Vigne, which I think is very likely, that gentleman having observed it in summer garb, remains to be determined. I understand that Dr. Falconer considers them distinct; and, at the request of Mr. Vigne, who furnished Dr. Falconer with some particulars with which he has likewise favored me, I leave this Kashmir species to be described by the latter eminent naturalist. I may, however, venture to publish two drawings of an antler of the Kashmir Stag (Plate, — figs. 8, 9,) in the collection of Mr. Vigne, the dimensions of which are already published in the Proceedings of the Zoological Society for 1840, p. 72, on the occasion of my exhibiting the specimen. This antler measured forty-four inches in length, and was eight inches round above the burr; the

general character being intermediate to that of the Wapiti and of the European Stag, but agreeing more nearly with the latter in its kind of granulated surface. Respecting the great Siberian species, we are informed by Pennant, (in his Arctic Zoology, p. 31,) probably on the authority of a private communication from his correspondent, Professor Pallas, that, "Stags are totally extirpated in Russia, but abound in the mountainous southern tract of Siberia, where they grow to a size far superior to what is known in Europe. The height of a grown hind is four feet nine inches and a half, its length eight feet, and that of its head one foot eight inches and a half," which is proportionate to Mr. Hodgson's admeasurements of the skull of the male,* and scarcely, if at all, inferior to the American Wapiti. I cannot bring myself to think that an Elk (*Alces Cæsaris*) is here alluded to; but may mention that a fully grown female Elk, which I measured alive in the Zoological Gardens, gave eight feet and a quarter from muzzle to base of tail, and stood five feet two inches high at the back; the apparent elevation of its withers consisting of hair only. Its head, measuring over the drooping upper lip to the rudimental naked muzzle, gave twenty-six inches and a half.

The ordinary fossil Stag of Europe, currently identified with *C. Elaphus*, is generally about one-fourth larger in all the dimensions of its antlers than the common existing species of the same region, as remarked to me, of the fossil specimens found in Switzerland, by my friend Professor Schinz, of Zurich; and this I have equally found to be the case in numerous examples obtained from the gravel and peat of various districts in the British Islands. It would even appear that a remnant of this larger race still survives in Hungary, or was in existence not many years ago. Of such an animal, it is stated, in a German sporting work, 'Wildungen's Wiedmann's Feierabende, (p. 91,) that the author "has to thank Count Erbach-Erbach for the antlers herewith carefully figured, (and one of which is copied in the Plate, fig. 11), which prove that the Giant Stag is not yet totally extirpated in Europe. The animal which bore them was shot by a Wallachian, in the year 1815, on the Imperial Lordship Rewantz, on the Buckowina, and the Count received the antlers from a friend who superintends the imperial

* Vide p. 722, ante.

studs in that province, and who assured him, that the specimen by no means represented one of the largest of the Stags still found in that country, and hoped that he would be able to send one still more considerable. The circumference of the burr was eleven inches and a quarter, (Rheinland measure,) and of the beam, above the basal tines, nine inches and a quarter. Extreme expanse, measured outside, five feet, and the innermost tips were three feet and half asunder. Length of the right horn, following the curvature, four feet from burr to summit.”* The character of these antlers is absolutely that of the British Red Deer, but the size equals the Wapiti; and it is strange that so grand a species, for such it must be, should still remain to be investigated and described. I am inclined to suspect that to this “Giant Stag” must be referred an extraordinarily fine pair of “German Stag horns,” that have been hung up, as I understand for more than thirty years, in front of a cutler’s shop, in Great Turnstile, London. These measure forty-one inches over the curvature, and ten inches and a quarter round at base, above the burr; the crown of one, in particular, is very fine; and of numerous other Stag antlers, imported from Germany, to be manufactured into knife handles, &c., not any approached to these dimensions. The antlers of the common European Stag, or British Red Deer, seldom exceed three feet in length, and are generally under; and the animal scarcely stands above three feet and a half high at the back; but its general form is more elegant than that of any other species of the group with which I am acquainted.

(*To be continued.*)

Explanation of the Plate.

Figure 3 represents a Wapiti Stag’s antler, *a* and *b* indicating the two basal tines or branches, or the “brow and bez antlers” of writers on *venerie*; *c*, the median tine, or “royal antler;” and the portion above *d*, *d*, the “crown, or sur-royal;” *e*, is a mere snag, of very common occurrence in this particular species, and not very unfrequently met with in the *Axine* group of Deer, where it is always thus directed

* For these particulars I am indebted to the kindness of Colonel Hamilton Smith, to whom a copy of the work was presented by the author, who was one of the chief observers of the game and forests of the Elector of Hesse.

upwards, and not outwards and forwards (like a veritable second basal tine, or "bez"). Neither the second basal nor the median tine ever occurs in the Axine or Rusa group, to which the *C. Elaphoides* may be referred, a species wherein (normally) each of the ordinary two coronal prongs of the Axine group merely *bifurcates*, with a tendency to subdivide further; the *C. Elaphoides* has, besides, the shorter and thicker body of the Axines, and no disk surrounding and ascending above the tail, as in the true or Elaphine Stags. Its naked muzzle, also (if I mistake not), is more expanded, as in other Axines.

Figures 1 to 6 represent some picked antlers of the Wapiti Stag (*Cervus Canadensis*); 7, of the young Jerräel Stag (*C. Wallichii*); 8, 9, of the Stag of Kashmir (*C. Wallichii* ?); 10, of the young *Maral*, or Persian Stag; 11, of the great Hungarian Stag; 12, a singular and very abnormal variety of the European Stag.

Figure 2 represents a Wapiti antler, with the basal tines a little removed apart, which is very seldom the case in this species, though common in *C. Elaphus*; fig. 3, represents a trifurcating crown, which is also rarely seen in the Wapiti; fig. 4, either wants the median tine, or has it removed so high up the beam that it appears part of the crown; figs. 8, 9, representing an antler of the Kashmir Stag, scarcely differ from fig. 2; fig. 10, representing an antler of the young Persian species (drawn from memory only, though I pledge its essential correctness), is remarkable for having its basal tines united for a short space where they issue forth, and may be compared with fig. 7, illustrating what I consider to be the corresponding age of *C. Wallichii*; in the northern European Stag (*C. Elaphus*), and a very nearly allied, but larger, fossil congener, the basal tines are even commonly as much separated as in fig. 11, though typically approximated as in the Wapiti; fig. 12, an abnormal antler of *C. Elaphus*, wants the second basal tine, which, however, is not unusual in young animals of this species, and presents a strangely ramifying crown; the specimen is in the British Museum.



Proceedings of the Asiatic Society.

(Wednesday Evening, 1st September, 1841.)

The Honorable Sir E. RYAN, in the Chair.

HENRY WALKER, Esq. Bengal Medical Service, and FLETCHER HAYS, Esq. 62nd Regt. N. I., Assistant Governor General's Agent, Saugor, proposed at the last Meeting, were ballotted for, and duly elected, to whom the necessary communications of their election and rules of the Society for guidance, were ordered to be forwarded.

The following gentlemen were proposed as Members, viz :—

The Honorable A. AMOS, Esq. by the Honorable President, seconded by the Honorable H. T. PRINSEP, Esq.

ROBERT BARLOW, Esq. C. S. by the Honorable H. T. PRINSEP, Esq. seconded by the Honorable President.

C. G. MANSEL, Esq. C. S. by the Honorable President, seconded by the Secretary.

Library and Museum.

Books received for the Library of the Asiatic Society, for the Meeting on the 1st September, 1841.

Illustrations of the Literature and Religion of the Budhists, by H. B. Hodgson, Esq. Serampore, 1841, 1 vol.

Discourse touching the Spanish Monarchy, London, 1654, 8vo. 1 vol.

Calcutta Christian Observer, September 1841, New Series, vol. 2d, No. 21, pamph.

Annals and Magazine of Natural History, May 1841, No. 43, London, ditto.

Calcutta Monthly Journal, July 1811, ditto.

Report on the Statistics of Western Australia, in 1840, Perth, Western Australia, 1841, ditto.

Oriental Christian Spectator, July 1841, Bombay, vol. 2d, No. 7, ditto.

Hammer Purgstall's Falkner Klee Wien, 1840, 1 vol.

Read the following report of the Officiating Curator for the month of August last :—

H. TORRENS, Esq.

Secretary, Asiatic Society.

SIR,—For the month of August I regret to say that illness and debility, during ten or twelve days, have prevented my doing much that I had in view previous to the arrival of Mr. Blyth, who may now be daily expected.

Geological, Mineralogical, and Paleontological Departments.—We have received here from Government several limestones from Cachar, with other specimens, collected by Lieut. BIGGE, Assistant to the Agent to the Governor General on the N. E. Frontier, with their analysis as limestones by Captain TREMENHEERE. I find, however, that they are of much higher interest than as mere limestones ; for three if not four out of eight contain organic remains ! I have not been able to identify the localities, which I believe to be farther to the Northward and Eastward than Dr. M'CLELLAND's valuable discoveries in that quarter, being from Cachar, (the Mukir range,) but the fact is important, if only as corroborating or connecting other discoveries.

We have also from Government a continuation of the collections made by Dr. WALKER in the Chinnoor Sircar, Nizam's territory : consisting of shale, coal, argillaceous limestone, sandstone, anthracite, &c. &c ; with a map of the Godavery from Chanda to below Mungapett, shewing the site of the coal, &c. &c. I have, I fear,

omitted to mention, in the July Report, the presentation of a copy of Mr. TASSIN'S large map of Bengal, by Government.

The printers are, I grieve to say, as dilatory as ever. I have only been able to obtain one proof, a day or two ago, for the whole month.

Osteological.—The skeleton of one of the samurs is in preparation.

Ornithological and Mammalogical.—Nothing new to report.

Botanical.—I have the pleasure to add here to my former report on our Lichens, that we have obtained a second, purple colour from the Society's Himalaya specimens; being No. 9, marked in my paper as an "orange crimson." I look with confidence to a third, if not a fourth, which, out of 19 sorts, will be a rich harvest. It appears that some months are required for the change from crimson to purple, as in the preparation of archil and cudbear in Europe.

We are also in this department indebted to Government for a valuable collection of gums, hemp, wax, silk, &c., from the Nizam's territories. I have handed to our Secretary a note on some articles sent on requisition by him, from Khorasan, (*via* Sindé,) by Lieut. POSTANS, amongst which are a new yellow dye, a new species of gall nut, and a very valuable sort of cotton, (the Nurma cotton,) which I have since found is highly prized in Malwa, where it is known by the same name. It is hoped this will prove of importance in the hands of Captain BAYLES and the American experimentalists. That no time may be lost, a memorandum has been transmitted to Government on this subject.

Museum of Economic Geology.—We have at length obtained all the new cases from our contractors. The original collection sent out by the Court of Directors is arranged; and I have added, from our own neglected stores, a valuable series of silver ores from Peru, and the remains of Captain FRANKLIN'S iron ores from Bundelcund, with specimens of gold, tin, copper, manganese, lead, &c. which can be fully spared; and are, in fact, utterly useless and lost as now lying dispersed, while here they form objects of both interest and utility, as being specimens of, or incitements to search for, our Indian resources, placed where they can be properly exhibited and studied.

The Donations to the Museum have been as follow:—

Scull and horns (imperfect) of Cervus Muntjack,	} W. A. Peacock, Esq.
(Barking Deer,) from the Tipperah Hills,	
The <i>Choudonah</i> Parrot, (<i>Psittacus</i>),	Mr. L. Swaries.
A collection of Rocks and Minerals from Arracan,	} Js. Hyland, Esq.
to accompany a paper presented at the last Meeting,	
Rocks and Minerals, from Cachar and the Naga territory,	} Lt. Bigge, Asst. Agent G. G. N. E. Frontier.
Rocks and Minerals, collected by Dr. Walker, Nizam's territory,	
A collection of Gums, Hemp, Wax, Silk, &c. from the Nizam's territory,	Government.
Mr. Tassin's large Map of Bengal, &c.,	Government.

I am, Sir,

Yours very obediently,

H. PIDDINGTON.

Museum, 1st September, 1841.

Read report on some Articles of Trade sent from Khorasan by Lieut. POSTANS, and a memorandum on Nurma Cotton, by the Officiating Curator. [Inserted in the present number.]

Read the following letter of 31st August last from the Officiating Curator, reporting result of his examination of Lieut. BIGGE's specimens.

H. TORRENS, Esq.

Secretary, Asiatic Society.

SIR,—Upon examining Lieut. BIGGE's specimens, which illness had prevented my doing earlier, I find three out of four of his limestones contain organic remains, and these I should say marine!

This is of very great importance as a geological fact, as it carries Dr. M'CLELLAND's discoveries much farther to the Eastward. At all events, a quantity of these specimens would be most highly desirable, both for the Museum, and for the Museum of the Honorable the Court of Directors, say three or four maunds weight of as many sorts of them as can be procured, so as to enable European geologists to compare with their collections.

You can then, doubtless, recommend this to the attention of Government, and through that channel he will probably pay more attention to the recommendation than if simply from the Society, which I fear is not in the best credit with collectors, of late years.

Yours very faithfully,

31st August, 1841.

H. PIDDINGTON.

P.S.—These are the specimens sent us from the Government Secretariat, with Captain TREMENHEERE's analysis, who seems quite to have overlooked the locality, for he notices them only as limestones!

Read letter, No. 1274, of 12th August last, from Mr. Secretary BUSHBY, forwarding 30 copies of the Cochin-Chinese Dictionary and Vocabulary for distribution.

Resolved—That 25 copies of the Dictionary be forwarded to Messrs. W. H. ALLEN and Co. of London, with instructions to distribute them to the learned Societies and individuals in Europe, agreeably to the wish of the Government, and that five copies be retained for the use of the Library of the Society.

Read a letter, No. 792, of the 25th August last, from Mr. Secretary BUSHBY, intimating the authority to the Coal Committee to make over a package received from the Court of Directors, containing specimens of copper ore, exhibiting the various stages of its reduction, for deposit in the Museum of Economic Geology.

Several specimens of snakes, minerals, &c. were presented by Lieut. M. KITTOE, accompanied with the following letter from that Officer :—

TO H. TORRENS, Esq.

Secretary to the Asiatic Society of Bengal.

MY DEAR TORRENS,—I had hoped to have been able to have attended the Society's meeting this evening, and have presented the few specimens of snakes and minerals,

&c. as per annexed memo. which I now send, but a relapse of fever prevents me. I regret that I should not have been able to have brought a finer and more extensive collection, but there are reasons for it, which the least mentioned the better.

I would beg to invite the attention of any member versed in mineralogy to the minerals; they belong to the iron formation of the Keunjhur Mountains, and appear uncommon.

The fish is, I fancy, a nondescript species of carp, it is a stone-sucker like the loach, and has like feeders or appendages to the mouth; it is like the "kalabanse," which is also a stone-sucker, but it differs in size, colour, and the shape of the mouth in particular; it is sometimes caught as high as $2\frac{1}{2}$ to 3 seers in weight. The specimen from which the drawing was taken was about $1\frac{1}{2}$ seer or more. I have never seen this in any other river but the Brahmen's, which abounds in fish, and this is the second nondescript fish I have found in that river.

The squirrel is quite destroyed; it has lost three inches of its tail, which quantum was of a pale slate colour. I believe the animal to be full grown, as there is a considerable variety of the tribe in the Keunjhur Mountains; perhaps this specimen is sufficiently perfect to admit of being properly described by CANTOR or M'CLELLAND, to whom it is my wish that all the specimens be sent, for examination and nomenclature. The snakes must go to CANTOR. There are several which are well known. I brought them merely to increase the stock, to enable the Society to furnish duplicates to other Museums. The birds' eggs are damaged; they will do in the room of better specimens.

The book I send, I consider to be a curiosity.

Yours sincerely,

CALCUTTA, 1st September, 1841.

M. KITTOE.

Minerals.

Three specimens from the iron formation of the Keunjhur Mountains.

Two Ditto of serpentine and one green quartz (?) from Juspoor.

Ditto of an elegant squirrel, Keunjhur hills.

Ditto 6 snakes, and a kind of scorpion, also lizard, Keunjhur and Mohurbhunj jungles.

Ditto broken, and of a hawk, called in Hindoostan "Luzzur."

An unfinished drawing of a fish caught in the Brahmen's river, believed to be a nondescript.

An ancient work in one volume, with manuscript marginal notes, entitled "A Discourse touching the Spanish Monarchy," translated from the Latin edition by CAMPANELLA, a Spanish monk, in the 16th century, printed in 1654.

A war-cap adorned with human hair, and a crest of the tail hair of the elephant, worn by the chiefs of the Naga tribes, together with some Naga spears and swords, were presented by Mr. MILNE, late in the employ of the Assam Tea Company.

The Secretary noticed the safe arrival of the taxidermist, who had been sent to Chybassa, and placed under Lieut. S. TICKELL, in pursuance of the plans the Society have in view, of placing taxidermists throughout the country, for the preparation of objects collected by Members, who take an interest in the subject.

For the presentations and contributions, the thanks of the Society were accorded.

At a Special Meeting held, on the 24th September 1841, of the Committee of Papers—

The Hon'ble Sir E. RYAN, in the Chair.

Read letter from Mr. H. PIDDINGTON of 9th September 1841, reporting that on the 6th idem he had delivered over charge of his departments of the Museum of the Asiatic Society to Mr. E. BLYTH.

Read the following correspondence with that gentleman :—

TO EDWARD BLYTH, ESQ.

SIR,—As you have now taken charge of the Museum of the Asiatic Society of Bengal, in your quality of Curator of that Museum, I am directed by the Honorable the President to address you, for the purpose of pointing out those particular points to which the Society would wish you to give your first and most earnest attention.

2. The Hon. the President in writing to Professor WILSON regarding the qualifications of a Curator for the Society, (a reference which resulted in procuring for the Society the advantage of your service,) made use of the following terms, in specifying what was required.

“We think the office should be filled by a person who can give to the Museum his principal attention, and be in attendance from 11 to 4 P. M. The Salary is 250 Rs. a month. As to duties, we require monthly reports on the state of the Museum. We do not allow specimens to be removed from the Museum. Our Museum has, in fact, two departments. The Oriental Antiquities, Numismatics, &c. &c. we must leave to our Oriental Secretary,—but as to every thing connected with Natural History in our Museum, we look to our Curator,—all this is specified in a paper in our Journal, or rather in the minutes of the Proceedings of the Society for December 1839, when the question was fully considered.”

3. The Hon. the President has desired me to enter the above at length for convenience of reference, although well aware that you must, in all probability, have already perused the passage in the original letter to Professor WILSON, before completing your arrangement with the Professor on the part of the Society.

4. The paper referred to, as containing a detailed statement of the Curator's duties, you have doubtless also seen. I append it (as published in No. 96, Asiatic Society's Journal, December 1839, p. 1060.), for readier reference.

5. “The first object of the Society,”—it is there stated—“in remodelling its Museum, should be to form a grand collection of minerals and fossils, illustrative of the Geology, Geography, and Palæontology of our British Indian possessions.”—This great object it is the anxious and earnest desire of the Society to see carried out; and with the Museum of Economic Geology now added to our own, and the very large, but still much disordered collections belonging to the Society, it is believed that opportunities exist of forming the basis, at any rate, of a great Mineralogical and Geological Collection, useful in every and all respects to the scientific Student, the Miner, or the Agriculturist.

6. The Hon. the President is most anxious to know, what course you propose to adopt in carrying out the design of the Society. The late officiating Curator, during the short period of his holding the office, has, as you will observe, done much towards the

classification of many of the superb collections belonging to the Society. His patience and energy have led to the recovery of many specimens supposed to have been lost, and to the restoration of more than one collection, such as Dr. GERARD'S, from the Himalaya, unique in rarity and value.

7. The Hon. the President does not doubt but that your ability and scientific knowledge will be steadily directed towards carrying out the general objects of the Society, but being specially interested, as in possession of the wishes of that body, upon the important question above noted, and being led to believe moreover that a different branch of science is that to which you are from habit and inclination most ready to devote your principal attention, he has directed me to request that you will oblige him by stating how far you consider yourself qualified to undertake the main duties of the Curatorship, (as stated in the accompanying paper,) including the charge, conduct, and advancement of the formation of the Museum of Economic Geology.

8. I am desired to observe, that the Society of which you are Curator, has always in view the interests, in the first instance, of India, as respects the elucidation of her natural phenomena, the development of her resources, and the advancement of knowledge in all branches of science whereby this country may be benefited. The Society works therefore for itself, and not subordinately to any other body whatsoever. The first fruits of all labour by its Members, or its Office-bearers are due to it; the subsequent results are of course available for general uses.

9. I am directed to request that you will favor the Hon. the President with a reply at your early convenience, and have the honor to be,

Your obedient servant,

H. TORRENS,

Secretary, Asiatic Society of Bengal.

TO THE SECRETARY OF THE ASIATIC SOCIETY.

SIR,—I beg to acknowledge the receipt of your communication, detailing the objects which it is the desire of the Asiatic Society should more prominently engage my attention, in endeavouring to fulfil the duties of Curator to their Museum; and I fully trust that, with the great facilities afforded me in maturing what acquaintance I already possess relative to the multitudinous and highly diversified objects of investigation committed to my charge, I shall, in reasonable time, be able to afford entire satisfaction to the Society, by carrying out their wishes in every department, which falls within the scope of my duties to investigate.

When, however, it is remembered that these duties comprise various departments of the general subject of Natural History, to which in Europe the principle of division of labour is applied, and that it is rare to find an individual minutely conversant with the details of two or more of these departments, to the extent which I consider necessary to enable me to discharge efficiently what is generally expected from an individual filling the office of Curator to a Museum, I think I may crave some indulgence on the part of the Society, if I do not, at the very first, prove alike proficient in every one of these several departments, confidently appealing to the experience of any practical naturalist, for an acknowledgment of the reasonableness of the plea which I have here ventured to offer.

It is in the Mineral Department, unfortunately, that I am at present less qualified, by previous study, to devote my immediate and first labours advantageously for the

Society ; but with the opportunities for study which are now before me, and with the liberal encouragement and support I may reckon upon receiving, I do not fear but that I shall soon render myself competent to discharge that portion of my duty which relates to the efficient management of the Museum of *Œconomic Geology* ; this being a subject in which I feel the liveliest interest, and with the high importance of which I am deeply and thoroughly impressed.

In all that relates to the determination of organic forms, recent or fossil, I hope to be already able to meet the wishes of the Society, having heretofore more particularly devoted myself to this exceedingly comprehensive branch of study, which has found me very ample employment in attaining to what information on the subject I at present possess.

With great respect,

Asiatic Society's Rooms,
Calcutta, 22nd September, 1841.

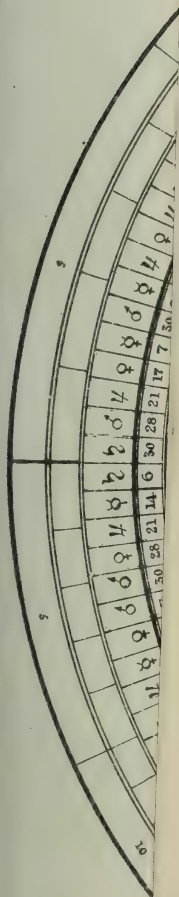
I am, Sir,

Your obedient servant,

EDWARD BLYTH.

Resolved, with special reference to the letter from Mr. E. BLYTH, that he be put in charge of the office of Curator, upon the understanding that the appointment will be made permanent, if at the end of twelve months he has qualified himself for carrying out the intentions of the Society respecting their Museum, as set forth in the Proceedings of the Society, recorded in the December No. (96) of the Asiatic Society's Journal, 1839.

Ordered,—That a copy of the foregoing resolution be communicated to Mr. E. BLYTH.



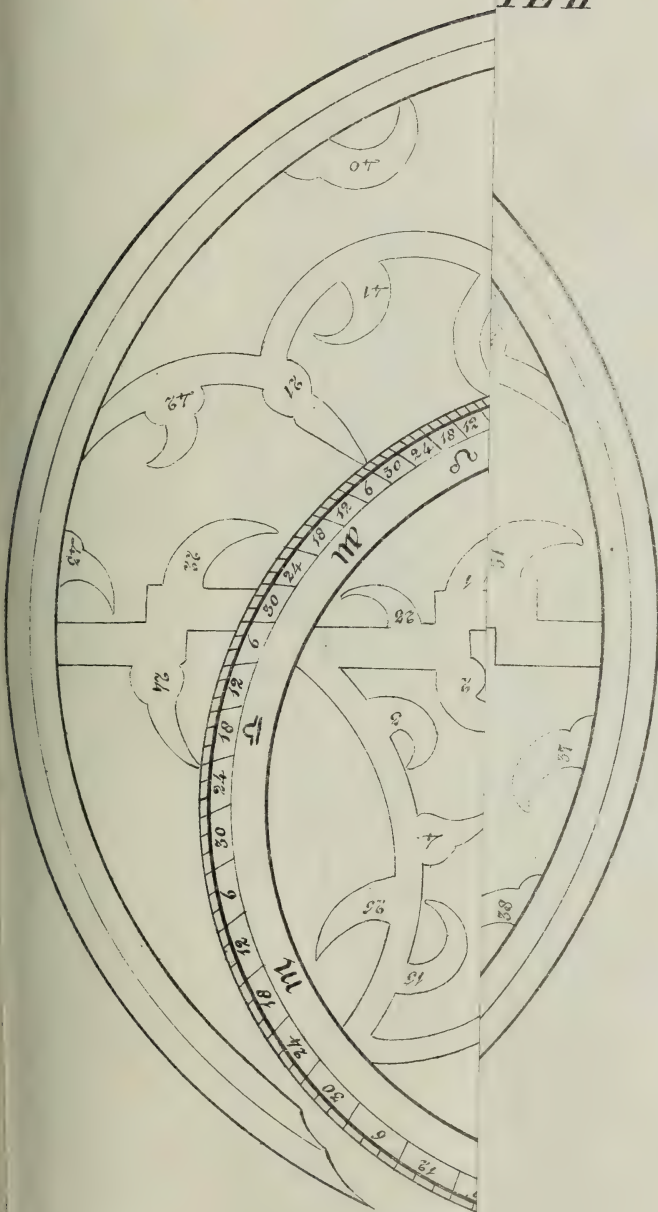
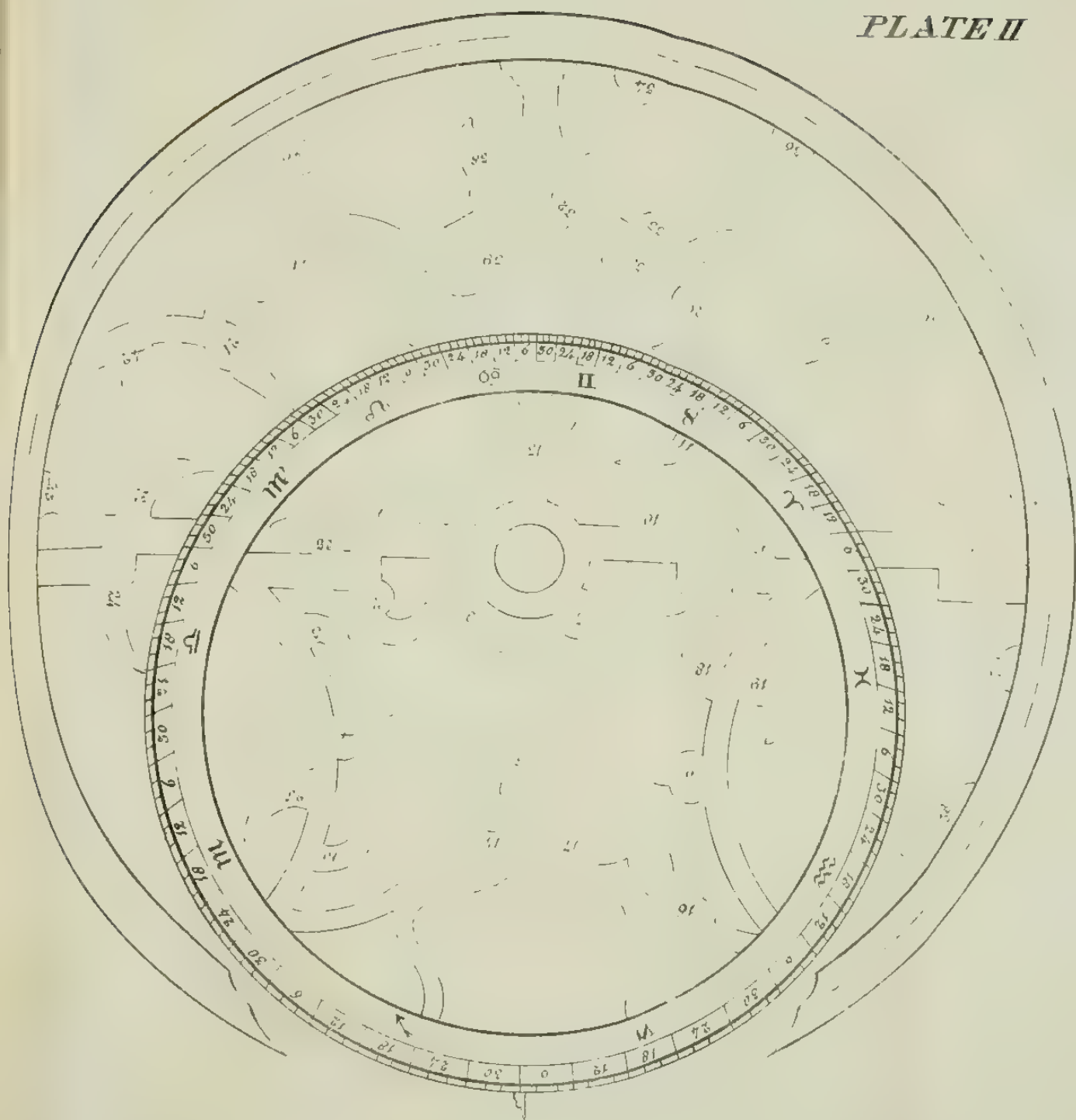
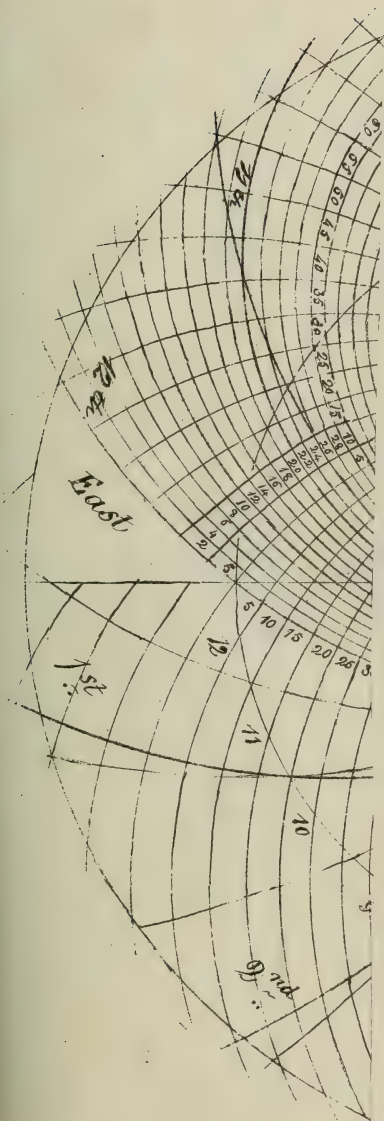
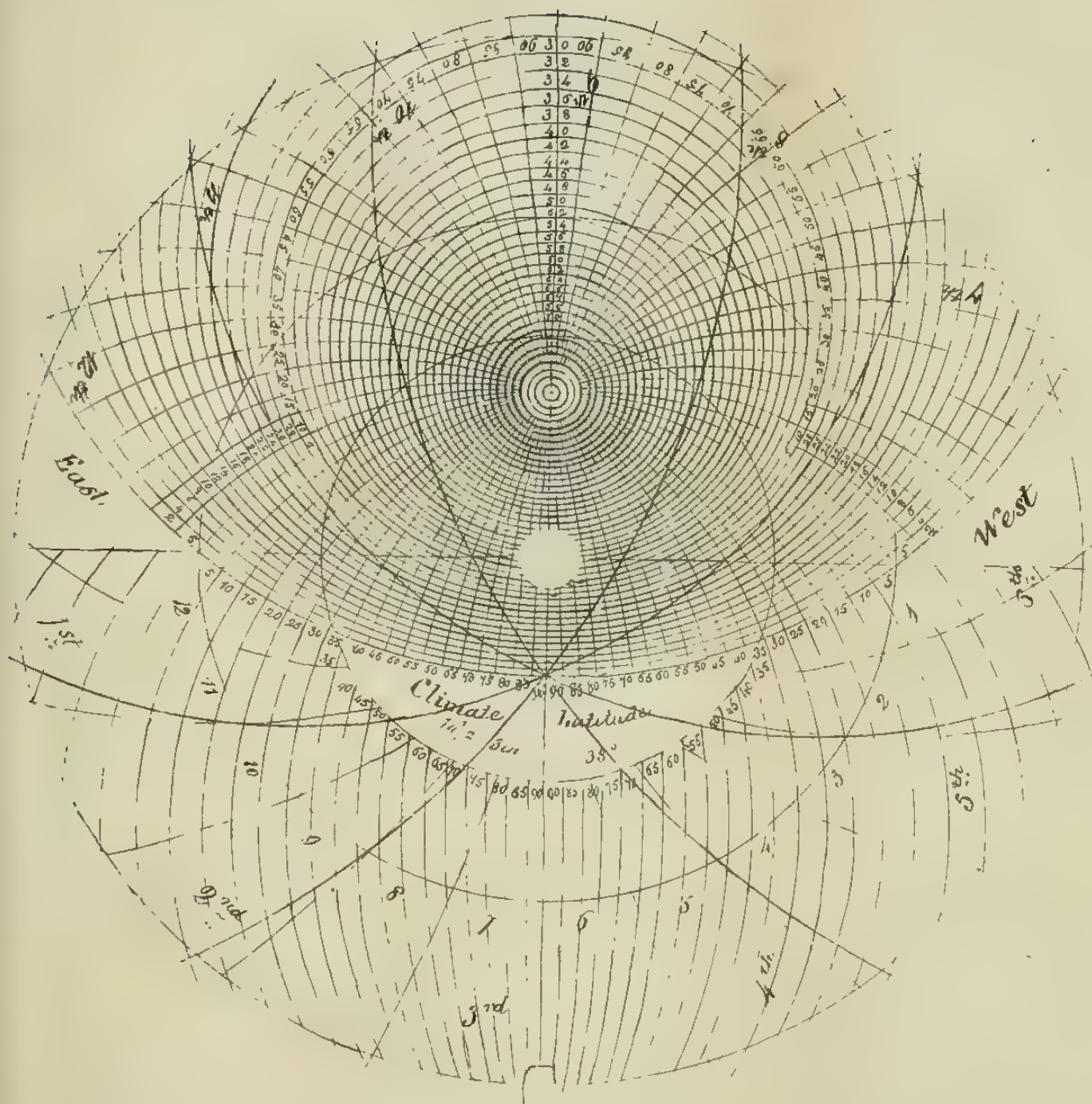


PLATE II







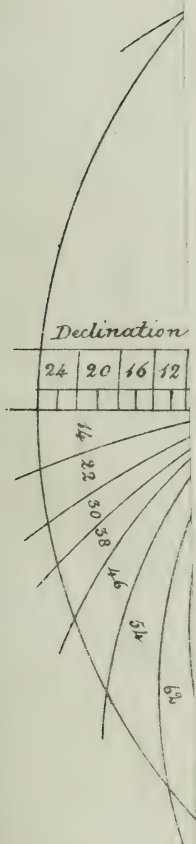
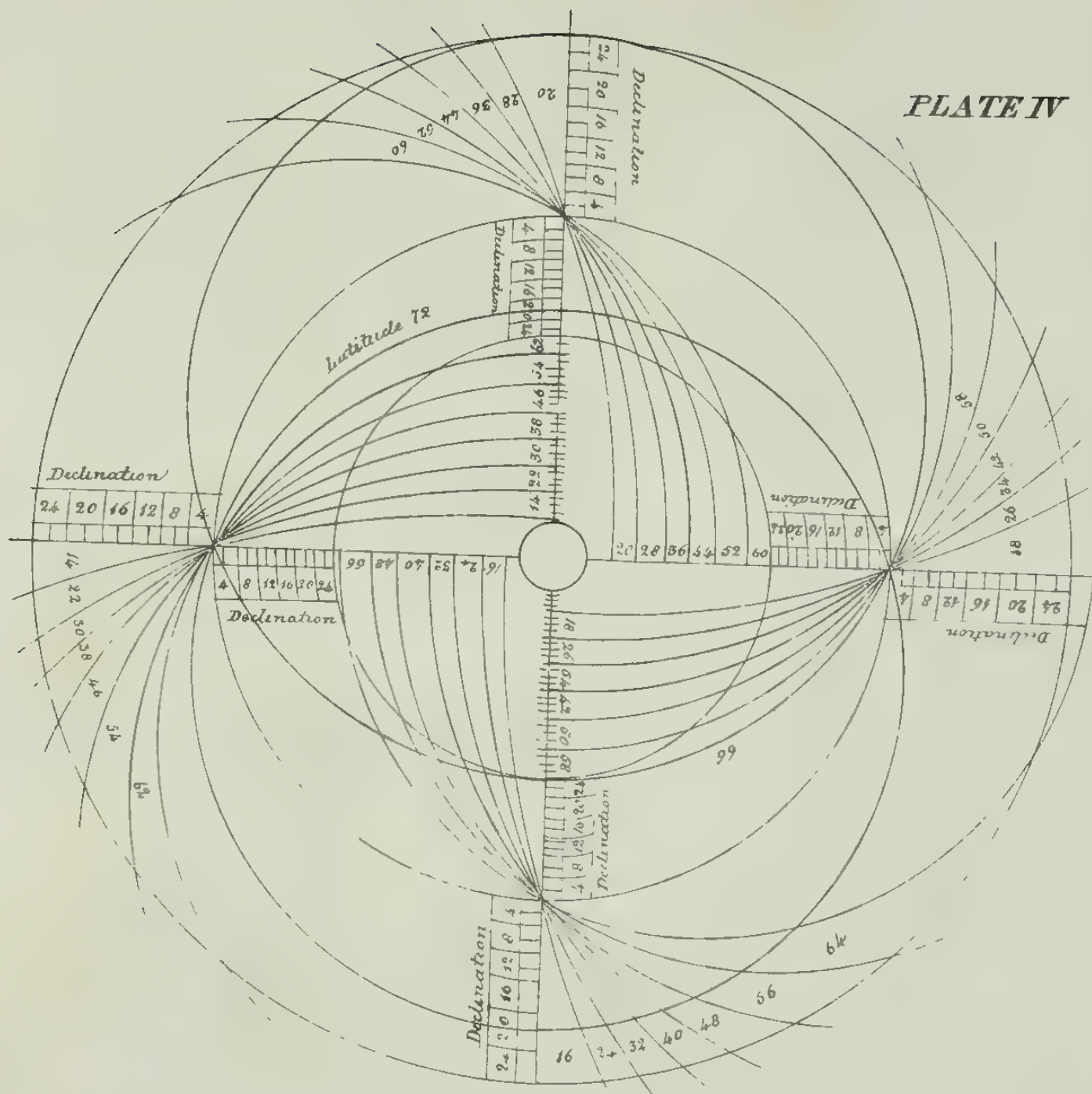


PLATE IV



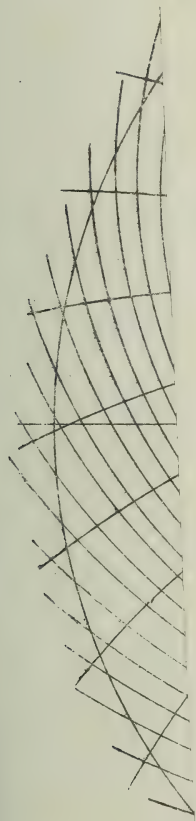
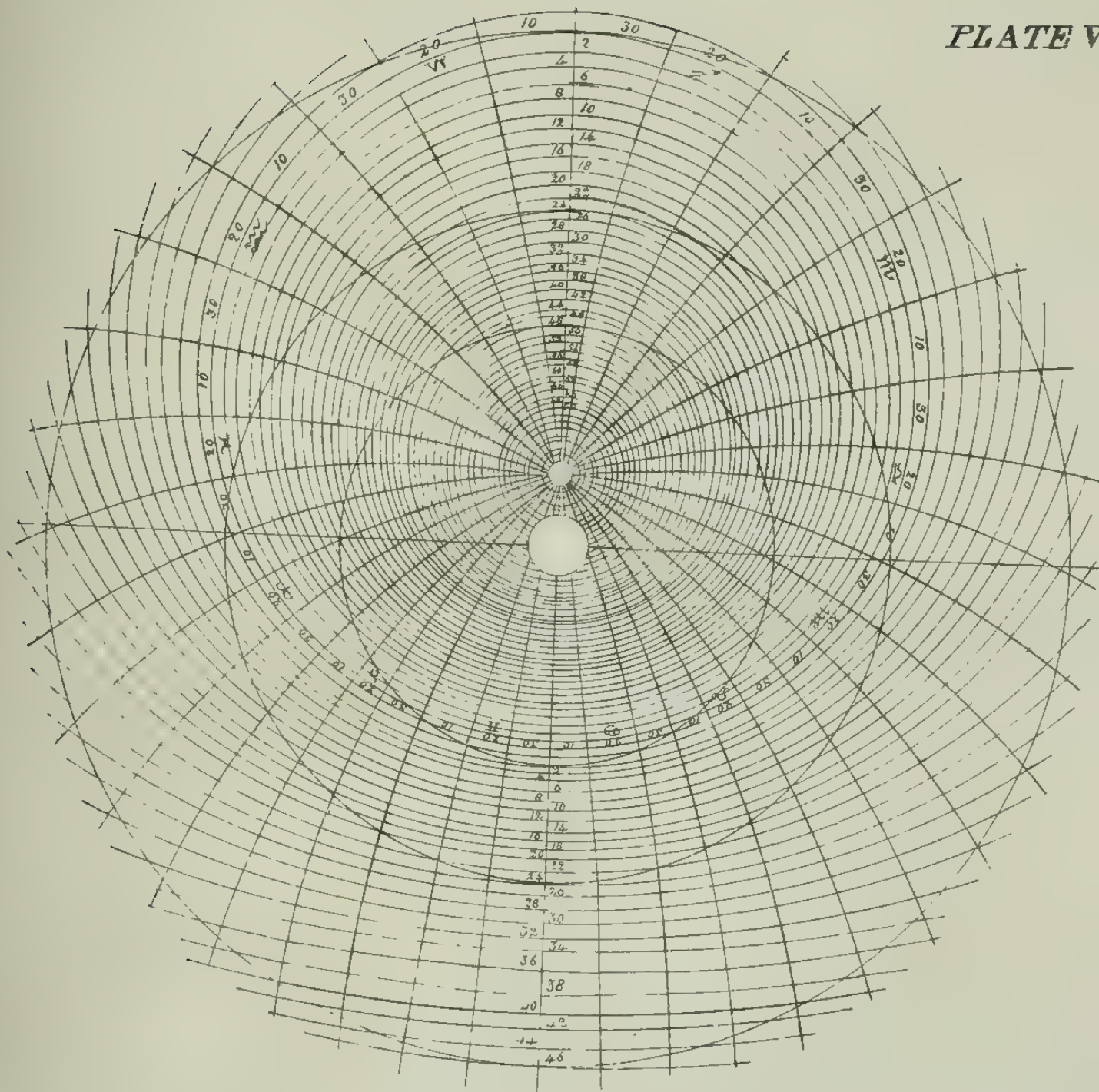


PLATE V



JOURNAL

OF THE

ASIATIC SOCIETY.

Description of a Persian Astrolabe, submitted to the Asiatic Society by Major Pottinger. By J. MIDDLETON, Esq. Principal of the Government College at Agra.

The Astrolabe, whose name sufficiently expresses the purpose which it was originally intended to subserve, seems at first to have been of very simple construction, consisting of two concentric rings of brass, the one revolving within the other, upon pivots fixed in their exterior and inner edges respectively. The instrument thus formed, was so placed, that its exterior circle coincided with the plane of the meridian; the interior one was then made to revolve till the shadows of that part of the limb, towards the subject of observation, overlapped that of the opposite part, when the opening of the rings shewed the meridional distance of the luminary. By a different adjustment of this simple instrument, the zenith distance of the sun, and hence the latitude of the place, could be nearly ascertained. Subsequently, the number of rings of which the instrument was composed, was augmented until not only the meridian, but also the Equator, the Ecliptic, the Colures, &c. were represented, and thus it was when Ptolemy found it, who established the principles, and contrived the means, by which to project the whole upon a plane surface; and to this projection he gave the name Planisphere. Of the modification of the Astrolabe the Arabs availed themselves, and were enabled by their improvements in science, especially in Trigonometry, to raise it to a degree of perfection which sufficed, during several centuries, both in Asia and part of Europe, for

the somewhat unscrupulous scientific purposes of those times. To what extent the Astrolabe may be now used by observers in Central Asia, I am unable to ascertain; but among Arab navigators it has given place, generally, to the quadrant or sextant, upon which it has conferred its name; the latter being called the *Belatee* (or foreign) *Oosturlab*. Though but little that is new can be said at the present day on the subject of the Astrolabe, about which volumes have already been written, yet the one which in this article, I propose to describe, is so superior in its kind, and displays a degree of taste and accuracy of execution, which we would scarce be prepared to expect from Central Asia, about a century and a half ago;* and it is at the same time so crowded with facts subservient to science, or superstition, that I am inclined to believe a short description of it will not be unacceptable. As to the plates, I may say generally, that for the Persian names of the planets and signs, I have substituted the Greek symbols, which modern times have adopted, and have changed for the Arabic numerals, those used by ourselves. To this substitution, I have necessarily sacrificed the elegance of the original inscription, in which the light and graceful forms of the Persian characters are tastefully intertwined with flowers. The object I had in view, constrained me to this sacrifice,—and that was, to present, in as simple and general a form as possible, an intelligible view of the instrument.

The Astrolabe in question was brought from Herat by Major Pottinger; it consists of a circular piece of brass, about eight inches in diameter, and three-fourths of an inch thick, being on one side so hollowed out, as to contain several plates of brass, upon either side of which Planispheres are described, according to the latitudes of the principal places of Mahomedan power or veneration. On its upper limb is a triangular piece of brass, not represented in the plate, through the apex of which a ring is freely passed, by which, for purposes of observation, the instrument may be suspended in the vertical. The back of the Astrolabe, with exception of the triangular part, above mentioned, is represented in Plate I. Fig. *a*. while the face is partially shewn in Plate II. I say partially, because the outer edge of the

* NOTE.—The Astrolabe was procured by Major Pottinger from a party, who had gotten possession of it on the flight of the original owner from Herat, some time previous to the last siege of the town by the Persians.

recess, in which the trelliced circle represented by Plate II. revolves, is divided into 360° , a mode of graduation well known to the ancients I have also refrained from introducing drawings of all the Planispheres; since the doing so would have swelled the number of plates to fourteen, without, at the same time, disclosing a new truth, or illustrating an old one.

Premising these general observations, I shall now proceed to more particular explanation, throughout which, agreeably to my plan, I shall abstain from introduction of the abstract forms of science. I shall also, for greater perspicuity, subdivide my description, and arrange it under heads corresponding with the purposes which the instrument is intended to serve; viz. those of Astronomy, Astrology, Geography—and first of its

Astronomy.—I have already said, that but little new can be adduced on the subject of the Astrolabe, and the same remark applies to Arabian science generally. The admirable works which the French *savans* have conferred upon the world on the Astronomy of the Ancients, leave but meagre gleanings for whoever may follow, especially in respect to Arabian astronomy. I shall therefore in the following remarks confine myself to a description of the astronomical uses for which the instrument in question was probably intended, and refer such who would acquaint themselves with the principles employed in its construction, to the “*Astronomie Ancienne*” of Delembre.*

In Plate I, which represents the back of the Astrolabe, the upper limb is divided from the left and right; or, as the Arabs express it, from the east and west points, into two equal parts, terminating on the highest, or zenith point; these quadrantal arcs are again subdivided into ninety equal parts or degrees, “the use of the limb thus graduated, is for observation of the altitudes of celestial bodies, whether for ascertainment of the latitude, or of the time. The instrument, it is true, might be employed with even greater accuracy for the determination of terrestrial heights and distances, but I am not aware that the Arabs ever do employ it for such purposes; the manner in which the Astrolabe is used, is this: the label, or index, Plate I. Fig. *b*. is fixed upon its back by its axis *c*, which not only secures it there, but

* qu: Bailly? Ed.

also passing through the centres of the Planisphere discs, together with the trelliced plate (Plate II) on the face, binds the whole firmly and compactly. The observer now suspends the instrument, by holding the ring mentioned above in his right hand, the line passing through the origin of the graduated *arcs*, and the centre thus being horizontal, while that through their terminus, and at right angles to the former, is necessarily vertical. The object to be observed is now made to coincide with the plane of the quadrants, and the label is turned towards it, until a ray of light pass from it to the eye of the observer, through the perforations of two small plates projecting from the label near its ends, and at right angles to its length, (Plate I. Fig. *b*.) The arc of the quadrant between the horizontal line and the edge of the label, will evidently be the altitude required. There are undoubtedly several sources of error, which would render such an instrument unfit for the purposes of modern science, but with those for whose use it was originally intended, its imperfections would be unimportant. It is evident, that in the observation described, the altitude obtained is too great by the whole amount of refraction, an error which becomes considerable, when the object is near the horizon. I am of opinion, to, that the error in reading off the altitude would not be sufficiently allowed for, when repeated observations are impracticable, under 5.' Another ground of inaccuracy would necessarily be the difficulty, almost impossibility, with such an instrument of taking the centre in observations of the sun. These errors, springing from different sources, might sometimes, it is true, correct each other to a certain extent, but this vague probability must, of course, be insufficient to produce confidence in the instrument.

The parallel straight lines on the left of the upper limb are semi-almacanthers, or semi-circles of celestial altitude, seen on their edges, while the concentric *arcs* on the right seem to be intended to connect those signs which have north declination with those which, in that respect correspond with them towards the south; such a table is committed to memory by Asiatic astronomers, to which the neat arrangement is well suited.

Under the central line, and symmetrical with the centre, are two rectangles, the one within the other, and whose length is twice their breadth. The figures alluded to, are immediately recognizable by

terms—horizontal shadow,—vertical shadow,—at their longer and shorter sides, respectively. These rectangles are each divided into two equal parts by the production of the vertical line above. They are next divided on the lower edge from the centre towards the right into twelve, and towards the left into seven equal parts. The vertical edges are also submitted to similar graduation. The meaning and principle of these graduations the next paragraph will explain.

To the Arab, as to the Hindoo astronomer, the *gnomon* was an important, if not an indispensable auxiliary. Some divide the shadow into twelve, others into seven equal parts, according to fancy, or the length of the *gnomon* employed. This scale, whether divided into twelve or seven parts, is of the same length as the *gnomon* itself, and is consequently only capable of measuring altitudes within the limits of 0° and $45''$, or 45° and 90° , according to the situation of the plane upon which the *gnomon* stands. In order to compensate for this insufficiency, two *gnomons* are used, one parallel to the horizon, and one vertical to it. At sun rise, it is evident, the shadow of the vertical *gnomon* is indefinite, and is for long after incapable of being used as a measure of altitude. Again, at the time of sun rise, the shadow of the horizontal *gnomon*, pointed as it is towards the east, is zero, and gradually increases as the sun ascends, until he has attained the altitude of 45° , when the shadow reaches the limit of its scale, and from that time ceases to be available as a measure of altitude. Whilst the shadow of the horizontal *gnomon* has been thus slowly stretching itself, that of the vertical has contracted to the further end of its scale, and is now prepared to perform the functions for which the other ceases to be qualified; and the same process is repeated, but in an inverse order, till the going down of the sun.

The scales by which shadow is measured, are sometimes made five times the length of the *gnomon*, the shadow being then divided into sixty and thirty-five equal parts; but as such a scale could not be laid down upon the instrument, without causing embarrassment, or injury to its compactness, the following ingenious artifice is resorted to. In construction of the Astrolabe, the horizontal scales, just described, are produced to the right and left respectively, the former being then divided into sixty, the latter into thirty-five equal parts. This done,

the edge of a geometrical rule is passed over the centre of the instrument and each of the divisions successively, and the points in which the same edge cuts the limb are marked ; the numbers corresponding to them on the original scale are then affixed, and thus the rectilinear scales have been projected into the more convenient form of circular ones, seen in the exterior demi-annulus of the lower limb. It is plain that, by means of these scales and the quadrants of altitude, the height of the sun being given, the length of the shadow may be found, and reciprocally.

Having thus described, however imperfectly, the astronomical uses of the back of the Astrolabe, I proceed next to its face, which exhibits a stereographic projection of the ecliptic on the plane of the equator. I should here mention, that Plate V. shews the method of construction here employed. If I recollect right, Delembre gives a less accurate method by which he believed Arabian astronomers effected this projection, and on this account I consider this a very accurate and neat plate, too important to omit, and by means of which, when fixed over the Planispheres by the common axis, yet left free to revolve, many interesting and useful problems, for which globes are used with us, may be readily performed. The numbers on its fancifully formed angular points correspond with those of the list of stars, with which this part of my description will conclude. On the instrument itself, the names, as given in the table, are neatly engraved ; this the flexibility of the Arabic character, and its susceptibility of packing, permitted ; with ours, on the contrary, it could scarce be done, and I have therefore preferred on that, and other grounds, the method of reference by numbers. I believe, observations regarding these stars should more properly come under the astrological head ; but as they are used for ascertaining the time of the night, &c. and as there is besides something very interesting about them, I prefer reversing them from that situation.

Ulug Beg, whose authority we have given for the position of the stars, was king of Samarcand, and flourished in the early part of the fifteenth century. He was an eminent astronomer ; and the accuracy with which his observations were made, is sufficiently proved by the fact, that on making computation from his data, for the present time, I could readily discover, with one exception, the stars inscribed on the plate. The

learned Hyde, who gives a Latin version of Ulug Beg's tables, which was obligingly lent to me by our worthy Secretary, in his able preface to that work, says of the author, "Inter distractiones animi et *repetita* regni negotia administranda ad subtiliora in scientiis investiganda se applicuit." And again quoting a contemporary historian and panegyrist, he says, "At celsus iste animus etsi in summo rerum fastigio esset constitutus tamen in pulverem mathematicum descendere non dedignatus esset." This historian, obviously, did not understand that the royal astronomer while thus engaged, was but drawing pleasure from its purest source, and inscribing his name on the bright heavens, in a character which would not soon be forgotten. We are informed by Ulug Beg himself, that for the observations, the result of which appear in his tables, he caused to be constructed a quadrant of great radius, "cujus radius altitudine Templi Sanctæ Sophiæ æquaret," and that the latitudes and longitudes of the stars thus obtained, were to serve as data for future computations, the method of effecting which, he himself supplies.

"Stellarum loca in tabulis designavimus pro initio anno Hejyra 841, at quovis tempore quis possit stellarum loca invenire cum singulis septuagenis annis solaribus per *annum* tantum gradum moveantur." The addition of 1° for every 70 years is not quite correct, as the precession of the equinoxes is about 1° in 72 years nearly, on the average, since the time of Ulug Beg; at present it is 1° in 71.66 years. Allowance is also to be made for the diminution of the obliquity, a fact which appears to have been unknown to ancient astronomers.

No.	Names.	Names with us.	Longitude accord- ing to Ulug Beg.	Latitude accord- ing to Ulug Beg.	Magnitude accord- ing to Ulug Beg.
1	ظهر الدُّبُّ	Dubhe, ..	4 ^s 7° 25'	49° 24'	2
2	قَايِد	Alioth, ..	5 19 10	54 9	2
3	سَمَاك رَايَح	Arcturus, ..	6 16 31	31 18	1
4	نَيْرِفَنَكْ	Alphekka, ..	7 4 34	44 30	2
5	نُسْرَوَاقِع	Lyra ..	9 8 19	62 0	1
6	مَنْقَارِ الدَّجَاجَةِ	Albire ..	9 24 25	49 12	3
7	ذَنْبُ الدَّجَاجَةِ	Aried, ..	10 28 46	59 42	2
8	قُطْبُ بَرَج	Pole of the ecliptic,	.. ..	90 ..	...
9	كُفُّ الْخَمْصِ	β Cassiopæ, ..	0 23 1	50 48	3
10	مَرْفُوحُ الثُّرَيَّا	α Persei, ..	1 25 7	29 21	2
11	رَاسُ غُول	Algol, ..	1 18 55	22 0	2
12	جَنْبُ الْمَسْلُوسَةِ	Mirach, ..	0 23 13	25 36	2
13	أَيَّوُوق	Capella, ..	2 14 43	22 42	1
14	رَاسُ السَّيِّدَةِ	α Ophiuci, ..	8 15 13	35 51	3
15	عَنْقُ السَّيِّدَةِ	α Serpentis, ..	7 14 25	25 48	3

No.	Names.	Names with us.	Longitude according to Ulug Beg.	Latitude according to Ulug Beg.	Magnitude according to Ulug Beg.
16	نسوطاير Nusre tayer,	Atair, ..	9° 24' 10"	29° 15'	2
17	ذنب العقاب Zunub ul oqab,	ζ Aquilæ,	9 12 31	36 15	3
18	منكب الفرس Munkeb ul phurs,	Sheat Alperas,	11 21 37	30 51	2
19	فم الفرس Phummul ul phurs,	Enir, ..	10 24 28	22 0	3
20	عيون الثور Aiwun ulsoor,	Aldebaran,	2 2 31	5 15	1
21	قلب الاسد Qulb ul asud,	Regulus, ..	4 22 13	0 9	1
22	ساق الاسد Saq ul asud,	*	.. ..	.. ..	..
23	صوفة Surphuh, ..	Deneb, ..	5 13 49	12 0	1
24	سماک اعزل Semak eazul,	Spica Virginis, ..	6 16 10	2 9	1
25	کفه شمايے Kuyh e Shumali, ..	β Libræ, ..	7 11 58	8 45	3
26	کفه جنوئيے Kuph e junoobi,	Zubene Schamali,	7 7 52	0 45	3
27	قلب العقرب Qubbul uqrub,	Antares, ..	8 2 16	4 30	2
28	ذنب الجدي Zunub ul judee,	γ Capricornus,	10 15 28	2 15	3
29	فم القيطس Phummul quytus, ..	γ Ceti, ..	1 2 10	12 18	3

* Regarding this star, I am uncertain; I do not meet with it in Ulug Beg's tables, and of other authorities whom I have consulted, some do not mention it, others think that Arcturus is meant.

No.	Names.	Names with us.	Longitude accord- ing to Ulug Beg.	Latitude accord- ing to Ulug Beg.	Magnitude accord- ing to Ulug Beg.
30	صدر القيطس	Sudur ol quytus, ..	0° 22'	25° 42'	4
31	ذنب قيطس جنوبي	Zunub e qutus e ju- noobi,	11 25 25	21 0	3
32	اليمني	Yud ul yumno, ..	2 21 13	16 45	1
33	رجل اليسري	Rejel ul yusra, ..	2 9 25	31 18	1
34	رجل اليمني	Rejel ul yumna, ..	2 18 40	33 21	3
35	يد اليسري	Yud ul yusra, ..	2 13 34	17 15	2
36	مسافت النهر	Musaphut ul nuhur, ..	1 16 40	33 15	3
37	ساق ايمن ساكب	Saqayyumune sakub, ..	10 26 19	21 24	1
38	شعراي يمانى	Sherai yemani, ..	3 6 19	39 30	1
39	شعراي شمالي	Sherai shumali, ..	3 18 22	16 0	1
40	طرف اسفينه	Turpho saphynah, ..	4 3 10	43 33	3
41	فرد اشجاع	Phurd o shijay, ..	4 19 31	22 30	2
42	قاعدة الباطية	Qaed utool batyah, ..	5 12 37	22 0	3
43	جناح الغراب	Junah ul ghorab, ..	6 2 46	41 18	3

Astrology.—This is a subject which, I am aware, has but little interests for us; yet I should have but unsatisfactorily completed the work I have undertaken, had I passed it over. Among the Mahomedans of India, too, so far as my information enables me to judge, Astrology is but little respected; some of the most intelligent of them, whom I have met with, and questioned on the subject, evidently disliked the inquiry; and generally replied to the effect, that there is no power in the creation but that of the Deity, and that it is against the religion of a true Mussulman to believe in other influences. It is however probable, that extreme ignorance on subjects connected with science may have as much to do with their disbelief, as rigid piety. What degree of importance may be at present attached to it in Central Asia, I am not aware; if, however I may judge from the care and finish which have been bestowed on this part of the Astrolabe, and its completeness, it is considerable; and I remember Major Pottinger stating, that the instrument was chiefly used for Astrological purposes, by the person from whom he obtained it. Towards the South West, it appears to have still its hold, since Lamartine informs us, in his Travels in Palestine, that on his visit to the eccentric Lady Esther Stanhope, he thought he could detect the secret of her surprising influence over the lawless tribes of the desert, in her enthusiastic belief, and apparent skill, in the sciences of Astrology and Palmistry.

Among the Hindoos it is still implicitly believed in, and the necessity which this imposes on those who profess it, of being acquainted with the prominent facts of Astronomical science, has served to continue down to our times *disjectæ membræ* of their ancient system, which otherwise, like the rest, would probably have been lost. I shall now proceed to explain, what part the Astrological constants engraved upon the Astrolabe, (Plate I. Fig. *a*.) bear in the casting of a Horoscope, be it natal or annual.

The interior of the rectangle, about the sides of which, as already explained, are distributed the divisions of shadow, as also the four interior demi-annuli of the lower limb are entirely devoted to Astrological purposes.

The rectangle contains the celestial Trignons, so called from their positions in the ecliptic occupying the vertices of equilateral triangles, together with the Planets which govern them by day, and those

which govern them by night. Their influences are expressed in general terms in the margin. Their order in the drawing is, according to that of Persian writing, from left to right, and hence perhaps the following arrangement will be found more plain :—

Trigons.			Governing Planets by Day.			Governing Planets by Night.		
γ	Ω	↑	☉	♄	♅	♄	☉	♅
♌	♍	♎	♊	♋	♌	♊	♋	♌
♏	♐	♑	♍	♎	♏	♍	♎	♏
♒	♓	♈	♐	♑	♒	♐	♑	♒

By the Hindoo distribution, the twelve signs constitute one Trigon, each of the vertical column constituting a side.

The inner demi-annulus contains the lunar mansions; they are 28 in number, and extend over the whole ecliptic; each representing, proximately, the space passed over by the moon in one day. Their names are as follow :—

No. of Mansions.	Names of the Mansions.	No. of Stars.	No. of Mansions.	Names of the Man- sions.	No. of Stars.
1	شريطین	2	15	غفر	4
2	بطين	3	16	زبان	2
3	ثريا	7	17	الكليل	3
4	دبران	5	18	قلب	1
5	هقاي	3	19	شوله	2
6	هناء	5	20	نعايم	3
7	ذراع	5	21	بلد	6
8	نثر	2	22	ذابح	2
9	طرفه	1	23	بلع	2
10	جيبه	1	24	سعاد	1
11	زبره	2	25	الخبية	Several.
12	صوفه	1	26	مقدم	Several.
13	عوا	4	27	موغر	1
14	سماک	2	28	رشا	Several.

These mansions occupy a prominent place in the Astrological system; certain actions are to be annually performed, certain to be avoided by a person throughout life, according to the mansion in which the moon was at the time of his birth. With the Hindoos, each mansion is divided into four equal parts, to each of which appertains exclusively a certain letter or syllable, according to which the name of a person born during the occupancy of such portion, has its commencement determined. For instance, the late Lion of the Punjab must have been born while the moon was in the 1st quarter of the 15th mansion, as to that alone belongs the letter **र** with which his name **रणजीत सिंह** commences. There are many other attributes which they possess, but which it would be tedious and unprofitable to mention. The names of Mahomedans are determined by the Koran, as the *sortes* of old were by a reference to Virgil.

The next demi-annulus contains the faces or aspects of the planets, the nature and importance of which are as follow :—Each planet views with full power the sign opposite to that in which he is, if in the 4th and 10th signs with one half, or so on.

The full power of a planet is represented in the plate by the number 60, the half by 30, &c. &c.

The third demi-annulus contains the signs of the Zodiac themselves, to which, as will be seen, the others are referred.

The fourth, and last, is occupied by the *hudoos*, or houses of the Planets, which I have termed, not happily I find, “comparative influences;” each sign is divided amongst the Planets. For instance, to Jupiter appertains the first six degrees of Aries, and consequently if he is within the limits of the first six degrees, he is in his own house; if between the sixth and twelfth degrees, in the house of Venus, and so on.

When a Horoscope is to be cast, a square is first described, and divided into twelve compartments as follows :—



The arrangement of the signs in this is intended to shew their position in the case when ♈ rises at the time, for which celestial interpretation is to be made.

In order to the casting of an Annual Horoscope, the following data have to be established.

First.—The master at the time of birth of the changing sign, *e. g.* if Aries rises at that time, the next year at the same hour it will be Taurus, and so on.

Secondly.—The master of the first house for the year.

Thirdly.—The master of Trigrams.

Fourthly.—The master of the sun's house at the beginning of the year, if the year begin during the day, and of that of the moon, if the year begin during the night.

Fifthly.—The master of the first house at the time of birth, if Aries or Scorpio rose at that time; Mars is the ruling planet if Taurus or Libra; Venus, if Gemini or Virgo; Mercury, if Cancer; the Moon, if Leo; the Sun, if Sagittarius or Pisces; Jupiter and Capricornus or Aquarius, if Saturn.

The above observations and computations having been duly made, the advantages and disadvantages, to which every planet is subject, are represented by numbers. The former are then added, and the sum of the latter subtracted from the amount of each. The remainders are now compared, and the planet which has the greatest remainder is the master of the year, and his influence is then paramount.

A similar, but far more complex process, is followed in determining a natal Horoscope; but which, as my object is merely to render

intelligible the inscriptions on the Astrolabe, it were superfluous here to enter into.

I shall now take leave of this part of my subject, with the hope, that a structure so laboured and unsubstantial, so carefully repaired and sustained by selfishness and priestcraft, will at no distant date crumble into dust, when the congenial shade of ignorance, which it now enjoys, shall have been dissipated by the sunshine of knowledge.

Geography.—I shall now describe the geographical and devotional parts of the instrument. The association of these two subjects in one category may at first sight appear singular, but it is none other than what the Astrolabe itself exhibits. I have not deemed it necessary to present a drawing of that part of the instrument exclusively devoted to these subjects, since I feel reluctant to increase the number of the plates beyond what is indispensably requisite; and in the present case, I have hopes of making myself understood by explanation alone.

The bottom of the recess in which the Planispheres repose, is divided by concentric circles, the common centre of which is the reason of the recess into the annuli. The outer of these contains symbols indicating the directions, generally expressed, of Mecca, from the places named in the annulus next below, and correspond with S. E. for South-East, &c. The second contains several of the principal places of Mahomedan veneration and power, beginning, of course, with Mecca. The third and fourth are devoted to the longitudes and latitudes of those places respectively, and the fifth is occupied with the azimuths of the Kaaba at each of them. The remaining annuli are similarly occupied; and thus by this neat arrangement, fifty of the principal Mahomedan cities in Asia, with their absolute and relative positions, are exhibited at one view. It must be confessed, however, that these latitudes and longitudes are, with a few exceptions, under the most favorable view of them, exceedingly inaccurate, and consequently, so are also the azimuths dependent upon them.* Such places as

* The following is their method of deducing the azimuth from the latitude. Having cut off from the meridian, beginning at the zenith, an arc equal to the sum or difference of the latitudes, and from the prime vertical an arc equal to the sum or difference of the longitudes, and from the points of section having drawn perpendiculars to the arcs; the point in which these perpendiculars meet is the zenith of Mecca. Then having drawn chords to the arcs denoting the distances of the zeniths, and those expressing the differences of latitude and longitude, they easily obtained, by Plane Trigonometry, the azimuth angle.

Mecca, Medina, and Ispahan, and a few others, have their latitudes and longitudes pretty correctly assigned; those of inferior note seem to have had them very carelessly observed, or perhaps merely guessed. I must at the same time confess my belief that, generally speaking, European mathematicians have not done their Arabian predecessors full justice, in respect at least to their longitudes; but that having assigned to them a first meridian from which they did not compute, they have unintentionally attributed to them errors that sprung from themselves.

The first meridian among the Greeks passed through the "Fortunate Islands," a meridian which Ptolemy adopted, and from which he made his calculations. These islands have been pretty generally believed to be the Canary Isles, probably from the circumstance of their lying at the Western extremity of Europe. I am rather inclined to think, however, that the place from which Grecian geometers, (and consequently their imitators, the Arabs,) commenced their longitude, was an *imaginary* one, and that therefore, like the *Lanca* of the Hindoos, its position was never satisfactorily ascertained.

The Fortunate Isles probably owed their origin primarily to the fabled *Hesperides*, and, secondarily, to that copious fertility of invention that sprung into existence about the time of Alexander, and which may be traced downwards to that of Columbus himself: an invention which filled up the blanks of unexplored regions with mysterious and delightful lands, untrodden by the foot of ambition, where the golden age still lingered in its bright perfection. Diodorus informs us, that the Tyrant Cassander sent one Gohemerus on an exploratory voyage, and that he discovered the island of Panchaia, astonishing for its wealth, and the innocence of its inhabitants: where the most perfect happiness, peace, justice, and voluntary obedience to the laws, had flourished for thousands of years; this was indeed a fortunate island, and probably the father of our family. Pliny the second informs us, that it was in his day believed by some, that the *Hesperides* still existed somewhere in that direction, but that there was much doubt upon the subject. He also states indeed, giving his authority, that the Fortunate Islands lie under the first meridian. "Juba de Fortunatis ita inquisivit; sub meridiem positas esse prope occasum a Purpurariis DCCXXV.M. passuum sic ut CCL supra occasum navigetur: deinde

per CCCLXXV.M. passuum ortus petatur." Without doubt, these were the Canary Islands, but there is no reason to believe that, by any observations of his, the navigator ascertained them to lie under the first meridian; it is rather to be suspected, indeed, that from their being a group, and lying in the supposed direction, he assumed them to be such. Pomponius Mela also attempts to identify the Fortunate Isles with the Canaries, but his description, more minute indeed than that of Pliny, is so tainted with incredibilities, as to convince us of the little reliance that is to be placed on the observations of those who supplied him with information. Some Arabian authors of the twelfth century have got over the difficulty of identification, by asserting, that the "Fortunate Islands" had been, before their time, submerged. However this may be, it may I think be easily shewn, that the first meridian of the ancients could not have passed over any part of the Canary Islands.

In order to ascertain the first meridian, as implied in their computations, I selected some of the principal places, and thus found it to be about $35^{\circ} 50'$ to the west of ours, and thus about nearly 6° beyond the most remote of the Canary Isles.* Bagdad for instance, according to Ulug Beg, in whose authority I have much confidence, lies in 80° E. longitude, while its ascertained longitude is with us $44^{\circ} 30''$, which gives for the first meridian of the Arabs, a position $35^{\circ} 30''$ west of ours, or about 5° to the west of the Canary Islands, and by the whole amount of this difference have the errors of Arabian longitudes been augmented where errors existed, and supposed where they were not. Playfair, for instance, in the introduction to his Geography, while commenting upon their inaccuracies, expresses surprise that they should so far have miscalculated the longitude of the *debouchment* of the Indus, which if he had taken their first meridian in place of the assumed one of the Canary Isles, he would have found it pretty exact.

To our Astrolabe belongs, as already stated, several circular plates of brass, upon which are inscribed stereographic projections of the

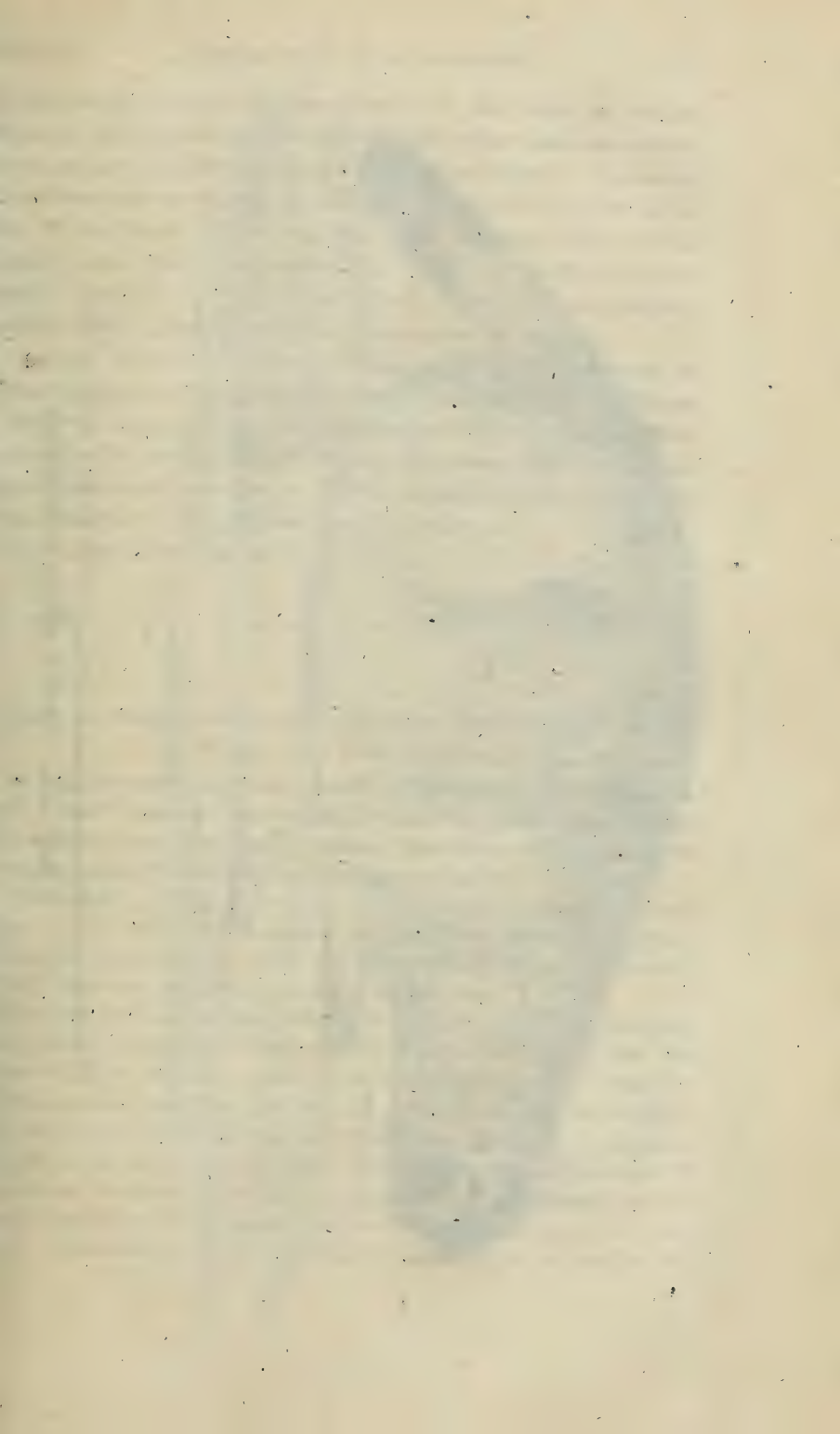
* The following computations confirm this statement:—

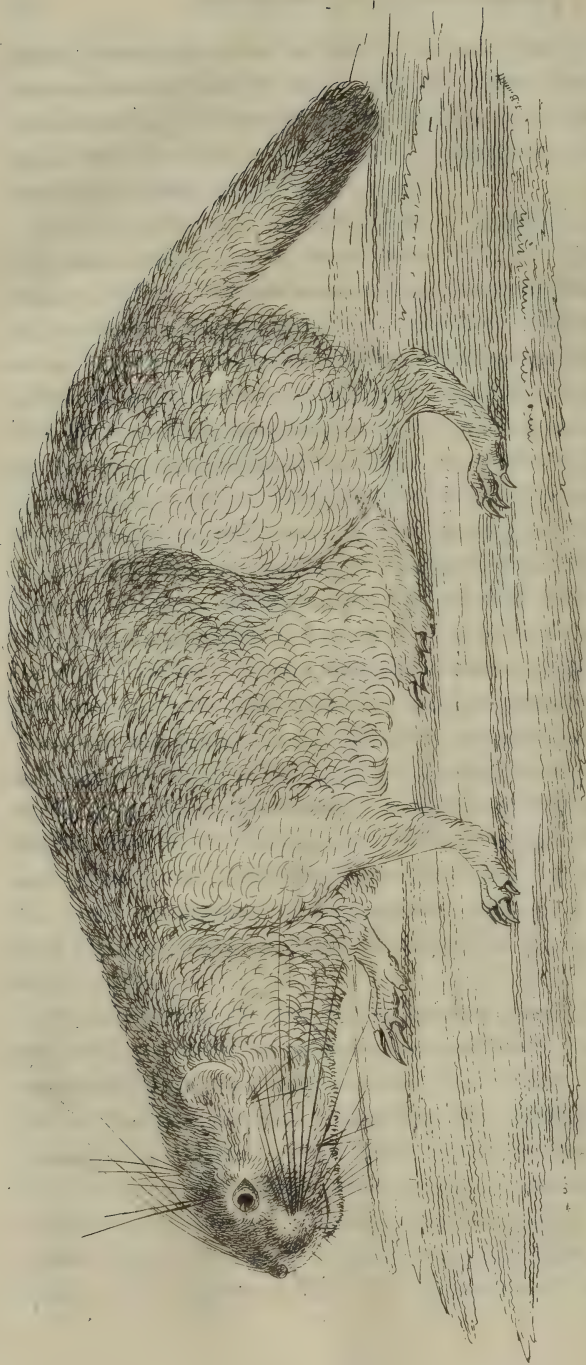
	a. Long.	E. Long.	Diff. of Long.	Average diff.
Medina,	$75^{\circ} 20''$	$39^{\circ} 20''$	36°	
Damascus,	72°	36°	36°	$35^{\circ} 53''$
Ispahan,	$86^{\circ} 40''$	52°	$34^{\circ} 40''$	
Sheraz,	88°	$52^{\circ} 45''$	$35^{\circ} 15''$	
Bussorah,	84°	$46^{\circ} 30''$	$37^{\circ} 30''$	

sphere, according to the latitudes of certain places. Plate III. is a representation of one of these, and only differs from the others in Polar altitude, or otherwise in the distance of the Pole from the assigned limit of vision, which in such projections, is supposed to lie considerably below the horizon : here 24° .

It will be seen from an inscription, at the centre of the plate, that it is characterised not by its latitude alone, but also by a certain measure of time. This was usual among ancient Geometers, who divided, arbitrarily, the earth into a certain number of climates by parallels to the Equator. The limits of these climates were determined, either by their equinoctial distance, or by the length of their longest day, or, as in the case of our Astrolabe, by both. The column of figures rising upwards from the margin of the plate towards the Pole, belongs to the parallels the latitude, of complements of which are numbered, obliquely, from the Equator northward, on both the east and west sides. The figures indicating the degrees of longitude, are arranged both ways from the meridian to the horizon, and are then continued under the Pole on a semi-parallel of latitude. In addition to the meridians and parallels of latitude, are two concentric circles parallel to the horizon, one above, and the other below it : these are almacanthers of altitude. There are also horary circles, with their corresponding numbers, commencing with "first" at the east point, and continuing round the sphere to the same point, also numbers commencing from at the west and ending with 12 at the east, the reading being backwards. These were called by the Arabs direct or reverse hours, for an obvious reason. The latter arrangement of the numbers arises, as I apprehend, from their being conceived to lie on the side of the sphere opposite to that of the former.

By means of the Planisphere, the moveable plate, (Plate II.) already described, and the circles of shadow and of altitude, numerous problems regarding latitude and longitude, time, the altitudes of celestial bodies, &c. are readily performed. Indeed, they serve pretty generally, in these respects, the purposes of our globes, with the great drawback, however, that each Planisphere serves only for its own latitude. Hence it is, that each Astrolabe has usually, in addition to their finished spheres, a model plate; after which others may be constructed. The representation of this is given in Plate IV. It consists of horizontal arcs des-





Arctomys Himalayanus. Marmot of Nepal and Tibet.
' $\frac{1}{2}$ nat. size. called Shupai and Chupai.

cribed for the different latitudes marked at their ends, as also the Equator, the Tropics, the Solstitial and Equinoctial colures and indications, in round numbers of the obliquity of the Ecliptic. On some of the Planispheres are drawn, the circles of *sirut* or circles of the direction of the Kaaba; on the one given it is wanting; a few of these appear on the right of the upper limb, Plate I. Fig. *a*. one of which is marked as the line of prayer for Ispahan. The others are similarly marked in the Astrolabe, but I have omitted the names.

In now taking leave of my subject, I have much pleasure in acknowledging my obligation to Rajchunder Dutt, an intelligent Pundit of Calcutta, now, I believe, employed at the Nepaul Residency, for the valuable assistance which he rendered me in decyphering the inscription; as also to Pundit Ruttunlal of this place, who has supplied me with much astrological information.

Agra, September 11th, 1841.

*Notice of the Marmot of the Himalaya and of Tibet. By B. H. HODGSON, Esq.
Resident at the Court of Nepal.*

In the extensive peltry trade carried on between Nepal and Tibet, no skin is more commonly met with than that of the Marmot, which I long ago named in my Catalogue, *Arctomys Himalayanus*, and now beg to furnish a summary description, and correct drawing of.

This animal is from twenty-three to twenty-four inches long from snout to vent, and the tail is usually from five to six more. It is a massive animal, larger than the Indian Hare, with weighty broad head, furnished with large eyes, and small, rounded, but apart, ears.

The neck is short, the body full, the limbs short, and of equal strength fore and aft, though the anterior nails be somewhat stouter than the posterior. The general structure of the feet, is that of the commoner *Murines*, or Rats, and the digits are cleft to their bases, as in the ordinary Rat and Mouse; but the nails are rather stouter, and more suited to digging, though not at all typically scansorial. The tail, one-fourth the length of the animal, is rather slender and cylindric, ending in a bluff point, and not having the hair at all more elongated, or more or less full than it is on the body. The incisors are very powerful, and the molars are as broad on the

crown, as they are high above the gum. Dental formula, incisors $\frac{2}{2}$ molars $\frac{55}{44}$. The distance between the snout and the fore canthus of the eye is greater than that to the base of the ear from the latter; and so broad is the head, that the eyes are $1\frac{5}{8}$ th inch apart in straight measurement. The general colour is a clearly fulvescent catsgrey, much like that of *Felis Chaus*, and fading into pure rufescent yellow below; the limbs and ears the same, but deeper; and the chaffron and end of the tail, dark brown. The fur is close, thick, composed like a cat's, but rather harsher, and of two sorts, or hairy and woolly: the hair, straight, elastic, about $1\frac{1}{2}$ inch of maximum length, and triannulate as to colour from the base, with dusky-brown, rufescent-yellow, and black; the last and apical part being the least; the woolly piles about one inch long, wavy, and void of the black tips; hands, feet, and face, dressed closely in soft hairs only. The following, then, may serve for a specific character, perhaps.

Arctomys Himalayanus, of a rufescent cat-grey colour above, and pure rufous yellow below; the limbs more saturate; the bridge of nose and end of tail, deep brown; the tail equal to $\frac{1}{4}$ of the length of the animal, cylindric and bluff pointed; the fur close, thick, composed of two sorts, and trebly ringed in all the upper parts with dusky, rufescent yellow and black; the wool, without the last ring of the hair; snout to vent 24 inches; tail 6 with hair; head $4\frac{3}{4}$; palm (with the nail) $2\frac{1}{2}$; planta (ditto) $3\frac{1}{2}$.

The habitat of this species is the Himalaya, and Kachar rarely, and very commonly the sandy plains of Tibet; gregarious in large bodies; live in burrows; hibernate for four months; have all the confident tameness of the Bay Bamboo Rat of Nepal, which they greatly resemble in manners; so that the people say of both, that when approached by men, they never think of running away; but put up their fore-feet civilly, deprecating the intrusion, and, if not heeded, resign themselves at once to captivity. The fat of the Marmots is much prized for certain medicinal properties, and is used as an unguent in rheumatism and gout. The cured skins are yet more valued for dress, and form an important article of commerce. Many come to Cathmandoo, and many more go to the towns of China, in the course of trade.

Nepal, June, 1841.

B. H. HODGSON.

Memorandum on the Organization of a Museum of Economic Geology for the North-Western Provinces of British India, to be established at Agra. By Lieut. W. BAIRD SMITH, Bengal Engineers.

The adequate representation and illustration of those important and extensive departments in the economy of life, in which the principles of the science of Geology are made subservient to the interests or comforts of mankind, may with safety be assumed as the chief characteristics of a well-organised Museum of Economic Geology. To insure such results, the resources not of science alone, but of art also are essential; since while the one indicates *when* general principles are applicable to special cases, the other shews *how* they are to be most effectively applied. In devising, therefore, a scheme for the organisation of a new institution of this nature, theory and practice must each have its proper place assigned to it, and each be illustrated by appropriate means. It has been my anxious endeavour to embody these views practically in the following details of the system proposed for the Museum of Economic Geology for the North-Western Provinces of India, and although it may be long ere the institution attains that completeness in its various departments herein specified, it has been considered advisable in projecting it, to do so on the most effective scale. Slow and laborious may be its progress, yet may it be anticipated that by the continual efforts of those interested in its success, even the highest point in the scale proposed, will ultimately be attained.

2. In the investigation of the mineral resources of hitherto unexplored districts, it is of the utmost importance to have a well-defined standard to which the newly discovered products of such regions may with readiness be referred. The basis, therefore, of the Museum in the department of mineralogy, ought, I conceive, to consist of a series of characteristic specimens of all minerals of established economic importance; and if it were possible to procure such specimens from the localities most celebrated for producing them, their value would in some degree be increased. The object of this collection being to impart as great an amount of information as possible, all its arrangements ought to be made subservient to this purpose. The specimens should be carefully

Characteristics of a well-organised Museum of Economic Geology.

Arrangements of the department of Mineralogy.

classified and named, according to an established system of classification and nomenclature, while means ought to be taken to exhibit for each those synonymes by which it is so unhappily burdened. I feel it a matter of considerable difficulty, from the existing state of Mineralogy, both as regards classification and nomenclature, to specify which of the many systems that have, from time to time, been proposed, is likely to prove the most useful. In truth, the many anomalies that disfigure even the most highly recommended of our methods of arrangement, and the excessive and bewildering multiplication of synonymes in mineralogical nomenclature, leave us but the power of selecting the least defective of the schemes that have been proposed ; so, that in expressing myself in the present instance in favour of the Natural History system of Professor Mohs, I would add, that I am fully conscious of its deficiencies, and of the anomalous results it not unfrequently exhibits ; but on consideration of its general utility, of its extensive adoption as the system of valuable mineralogical works, and of schools of instruction, I am disposed to prefer it to the rival chemical system of the celebrated Berzelius, the only one that can compete with it. Believing, however, that minerals will never be grouped according to the system that actually exists in nature, save by a method of classification that, without being rigidly based either upon their external physical properties alone, as in that of Mohs, or on some arbitrary relation of their chemical constituents, as in that of Berzelius, takes due cognizance of both classes of characteristics, and forms its orders, genera, and species, in accordance with the natural analogies of these, I regret much that I have never seen the system recently proposed by Professor Naumann, of Freyberg, which is based on the preceding mixed principle, and which, in the opinion of Mr. Whewell, himself a Professor of Mineralogy, is the best hitherto published.* Till this system becomes known in India, I would recommend adherence to that of Mohs, in the classification and nomenclature of the mineralogical department of the Museum.

3. While it is essential to the completeness of the Museum that all
Metallic minerals minerals of established economic ratio should have
Coals. place in it, their high commercial and social im-

* History of Inductive Sciences, vol. iii. p. —

portance give a marked pre-eminence to those of the metallic and carbonaceous orders. Both of these ought, accordingly, to be illustrated to the greatest extent of detail that circumstances will admit of, and specimens of metals, with their various ores, as also of the different species of coal, are of primary importance. The opportunity thus afforded of studying with care those external characters which, by experience, have been recognised as the indices of certain properties in the minerals exhibiting them, may frequently enable us to pronounce an immediate opinion as to the economic importance of newly discovered members of either of the two orders above alluded to. Specimens of each metal when it occurs native, accompanied by others of its native salts and ores, are, I therefore conceive, essential to the illustration of metallic mineralogy, while specimens of all the varieties of coal, both of such as are considered good and bad, are equally essential to that of carbonaceous minerals. As subordinate to the former, specimens of the different matrices, whether of rock, gravel, sand, or clay, in which metallic minerals occur may be provided, while in the same relation to the latter, specimens of the rock, that constitute the coal formation, together with their characteristic fossils, would prove most useful. Some farther remarks relative to the illustration of these two important orders will be made in noticing the mechanical details in Metallurgy and Coal Mining; and I would only add as a reason for adverting specially to them at present, that there is abundant reason to believe, the North-Western Provinces of India afford, both in metal and coal deposits, fields of the richest character. Metallic minerals have long been known, and wrought for commercial purposes throughout them, and indications of extensive coal beds have very recently been discovered in the Himalayas, so situated, as in the estimation of their discoverer, to be of the highest importance to our lately acquired right of navigating the Indus. This, indeed, is but one of many causes that at present combine to give importance to such researches, and to urge upon us, increased activity in their prosecution. The most powerful of all these stimulating causes will probably be found in the execution, in all likelihood at no distant period, of a grand line of internal navigation, connecting the remotest limits of these provinces, with the central mart of Indian commerce, and promising, from the scale on which it has been projected, to admit of such increased

facilities of intercourse, as may be expected to awaken to new life the commercial energies and enterprise of the valuable districts, through which it will pass.

4. Since it may be expected that many of those persons willing to avail themselves of the existence of the Museum to become acquainted with the principles of Economic Geology would require information of the most elementary character, I consider it would add to the useful effect of the Museum, were measures adopted to facilitate the acquisition of such knowledge. As addressing themselves more immediately to our senses, the external characters of minerals first claim attention, and among these, the high importance of crystalline form, arising from its constancy in the same substances, naturally suggests that some measures should be taken for the illustration both of the general principles of Crystallography, and of the manual operations by which these are practically applied to the determination of particular bodies. For the former object, it would I think be found most useful to have a series of model crystalline forms, so arranged, as to exhibit distinctly, those varied, yet determinate modifications of certain primary forms, which are found to exist among crystallised bodies in nature ; for the latter purpose, goniometers, or instruments for the measurement of angles of crystals, both of the common compass and reflective kinds, ought to be provided. Those brilliant optical phenomena exhibited by minerals, possessing the property of double refraction, under the influence of polarized light, and which furnish us with new means of referring these minerals to the systems of crystallisation of which they may be members, require for their display an apparatus of the most simple character, consisting only of a few pieces of common glass, and any non-metallic reflecting surface. For the determination of the important property of specific gravity, a hydrostatic balance, or properly constructed hydrometer would be essential, while, a small magnet and electrometer would be necessary for ascertaining the magnetic or electric properties of any mineral under examination. Separation of the most important characters is elicited by the employment of the blow-pipe in the examination of minerals. This therefore, with its necessary accompaniments of fluxes, &c. would be required, and with the addition of a few minor articles, as files, knives, pincers, &c. would

Requisites for the determination of the external characters of Minerals.

complete the list of requisites, for the determination of the external properties of mineral substances.

5. But these physical properties will not in all cases suffice for the identification, still less for the determination of the economic value of newly discovered minerals; and were we

Reason for the attachment of a chemical laboratory to the Museum of Economic Geology, North Western Provinces, and anticipated benefits.

to take cognizance of them alone, we would be led, as Mohs has in many instances been, to class together substances of the most different nature, on account

of their external resemblances. Farther, it has been found, that there exists in nature a class of bodies between which the singular quality subsists, of being competent to replace each other in compound minerals without in the slightest degree affecting the external characters of these. Since the class of isomorphous substances is by no means limited in number, the necessity of having recourse to the definitive test of chemical analysis before deciding on the real nature of any mineral presented to us, becomes apparent. The attachment therefore of a small, but effective chemical laboratory, to a Museum of Economic Geology is, I consider, essential to the efficiency of the institution. Such a laboratory ought to be fitted up with special reference to mineral analysis, and as the apparatus and re-agents required for this are not either very extensive or expensive, the necessary outlay would, I believe, be amply compensated by the results of its operation. It is not merely in the department of mineralogy that its aid would be required; but it will be found, as we advance, that in almost every department of Economic Geology the results of analysis will prove most important,—important not only in an economical, but also in a purely scientific point of view. It is to be remembered that mineralogy is no more limited to the mere identification and classification of minerals than is Astronomy to those of the heavenly bodies, or Botany to those of plants. Like any science it has to do with causes as well as an effect; with laws as well as results, and its true limits will only be attained, when to a clear development of physical properties, it adds the discovery of those principles of internal organisation of which these properties are only the visible exponents. An element of the first importance towards such discoveries, is a thorough acquaintance with the chemical components of mineral substances, so that viewed only as a boon to pure science, the application of analysis

to the mineral products of the North-Western Provinces would be of the highest order ; and the field is so novel and extensive, that we could scarcely fail to develop information at once valuable and interesting.

6. From the experience already obtained in the prosecution of mining operations in this country, it appears that one main obstacle to their success has arisen from defective knowledge of the practical and working details of such operations. In the arrangements of the practical department of the Museum, our efforts ought accordingly to be directed to the removal of this deficiency, and measures ought to be adopted for procuring, from the best sources, the means of illustration required. Primarily, in the case of metallic minerals, specimens of the ores of each metal, in the different stages of their progress, from their original extraction from the matrix to their production in a state fit for commercial or general purposes, ought to be procured, and arranged systematically with every reference to instruction. For the illustration of each process, wherein apparatus or machinery is employed, models of these ought, whenever practicable to be procured, and on such a scale, as to admit of the exhibition of details of construction. Farther, similar models exhibiting the underground arrangements of the mine, the means of ventilation, whether by shafts or machines, of keeping the mines free from water, of conveying and raising to the surface the rough material, and generally such other practical details as it may be possible to represent in this manner, would prove most useful. It would, I conceive, be perfectly practicable for a person familiar with the subject, and with modelling, to represent in a single model, the entire series of details now adverted to, and although such a model might prove expensive, yet since the information to be derived from it, would be in every respect of more practical benefit than that afforded by drawings, or oral or written descriptions, I do not think a complete Museum of Economic Geology ought to be without something of the kind. Models of the most approved forms of miner's tools would also be most useful ; and since blasting with gunpowder is constantly had recourse to in all extensive mining operations, the series of tools necessary for that purpose may be annexed. Arrangements of a nature similar to those just detailed,

Means of illustrating processes of Metallurgy and practical details of Coal Mining.

would be necessary to the illustration of practical coal mining. In reference to this branch of the subject, it may be remarked, that the strongest evidence of the necessity of taking effective measures to extend an acquaintance with the practical details of coal working, may be found in nearly every page of the valuable and interesting report of the Coal Committee, and from these documents, the most authentic as well as extensive records we possess of Indian mining operations it may be learnt, that to deficiency in this respect, combined with neglect of proper investigation of the fields themselves, the feeble success of our coal mines is chiefly to be traced. With new fields opening to us in the North-Western Provinces, it becomes us to follow another course, and by taking measures to disseminate practical information, and also by careful examinations of the deposits that may be discovered, to guarantee, as far as we can, its legitimate return to invested capital, and to enterprize its merited reward. The survey of a newly discovered coal field being conducted either by the sinking of shafts, or as is in every respect superior, by the employment of the method of boring, it is advisable to represent the tools and working apparatus required for the latter operation in model, as part of the illustrations of the department under notice. There would be the less difficulty in doing this, since the whole series is in this country, and unless recently removed, is, I believe, lodged in the arsenal of Fort William. In a former paragraph, the propriety of having a complete suite of characteristic specimens of the varieties of coal was alluded to, and these, combined with the series of illustrative models, would afford a most useful study to individuals desirous, either of prosecuting or directing coal-working operations. There are certain subordinate points, as for example, the kinds of furnaces best calculated for the different varieties of coal, the uses to which inferior descriptions of the mineral, as those highly impregnated with pyrites, may be put, &c. &c. on which information may be conveyed with advantage. Time must elapse ere the Museum for the North-Western Provinces could be complete in the practical departments now being noticed; but in a few years, provided its objects are energetically pursued, it may be expected to become an institution of the highest utility to this part of the country, and will I have no doubt, realise the expectations that have been formed of it, both in regard to its economic and scientific importance.

7. The next department of the Museum, on the arrangements of which I would make a few remarks, is that of Architecture and Civil Engineering; in which are included the various applications of the rocks composing the earth's crust, to the purposes of common or hydraulic architecture; of road-making, in the formation of mortars or of cements. Since each of the great systems or series of rocks, formed the distinct epochs that have been recognised by geologists furnish materials adapted to some of the preceding objects, it would be well to place in the Museum, a suite of characteristic specimens of the individual rocks composing these systems, arranged according to that order of superposition, which has been found to prevail among them in nature. It is, however, to be remarked, that those lithological characters of rocks, on which their applicability to the purposes of the architect and engineer is dependent, vary so much in different localities, that although a particular rock may, in one country, be admirably adapted to such purposes, it by no means follows, that its equivalent in another, must be equally so. Hence, although it would be useful in aiding research, to have in the Museum such a collection of specimens as I have above averted to, yet in this department our chief object should be to procure, with the least possible delay, a collection of native, not exotic rocks. It is by the investigation of the physical and chemical properties of the former, that information available for practical purposes in this country, is to be procured; and although comparison of these results with others obtained elsewhere would, of course, be interesting, and in time might be instituted, it is I consider, of secondary importance. Specimens, therefore, of all natural products, employed in the department of Public Works, whether as building materials, road materials, or materials for making mortars and cements, ought to be procured for the Museum, and their properties experimentally investigated.

Considering the extent to which Public Works are now carried on, and the number of intelligent individuals employed upon them, it cannot be doubted that a large amount of information, specially relating to the department of Economic Geology under notice, exists in the community; and were the Museum established, it would prove the means of concentrating this for general bene-

fit and use. In process of time, when specimens and information had accumulated to such an extent, that the resources of the different districts whence they had been procured were duly represented by them, it would be practicable to construct a map of these Provinces, from which would be gathered at once, the extent of means available for Public Works in any given localities, and much aid afforded to officers deputed to conduct such works, to whom the districts might be unknown. Beyond the simple facts of rocks having been extensively used as materials for different purposes in our Public Works, and having in several instances been found most useful, we possess no farther information regarding them. No definite details of their physical or chemical properties, of their power of cohesion, adhesion or absorption ; of their mineral characters, geological relations or component, parts have ever been furnished, and till we know something of these, we can form but very indefinite estimates of the real economic value of any materials we may have at command. To accumulate information on the points just mentioned, and to encourage farther investigation, so that the sites of new materials may be discovered, will be regarded as objects of higher moment, when it is borne in mind, how intimately the agriculture, and consequently the revenue of these provinces is dependant on the facilities, with which works for the purpose of irrigation can be executed, and how extensively the materials alluded to, are employed in the execution of these works. In like manner, the interests of trade afford a motive for encouraging investigations, relative to the materials for the construction of roads, so that viewed generally, the prosperity of the country is intimately connected with the effective illustration of this department of the Museum. The properties possessed by sandstones, limestones, or dolomites, fit them best for the purposes of building, and those possessed by rocks of igneous origin, as trap, or basalt, for road-making ; hence both classes become of economic importance, and ought to have place in the Museum. For the illustration of the mortars and cement, specimens of the materials employed in their formation, from the pure limestone, to the impure argillaceous kunker, together with models of the best forms of kilns for burning, and of mills for crushing, ought to be provided, and would, I think, complete this department of the Museum.

8. The importance of the department of agriculture in the Economic Geology of the North-Western Provinces is so great, that we can scarcely be too anxious to insure its effective illustration and development. Arrangements of the department of Agriculture. Under it may be included investigations of the geological relations, the chemical composition, and the capabilities of different soils, of the influence exerted upon these by waters of irrigation, natural and artificial, and of the nature and effects of the application of varieties of mineral manure. To illustrate the geological relations of the soils of these provinces, specimens of the rocks that may be found to underlie them, and from which their mineral constituents may have been derived, ought to be procured for the Museum. There are of course many localities, as the great alluvial districts, and the valleys of the great rivers of India, the soils of which can be referred to no particular derivative rocks, but which have been derived from many sources, yet where such rocks do occur, a most intimate relation necessarily subsists between them and the soils to which their disintegration, by natural causes, has given origin. It is this relation which gives so much of their value to the geological maps of districts, and render them of so much utility to the scientific agriculturist. From those localities, therefore, in which particular kinds of soils may be observed, specimens of the soil itself, of the underlying rock or stratum, and also of the sub-soil, or portion intervening between the soil and rock, and exhibiting the gradual transition from the one to the other, ought to be forwarded to the Museum, and there systematically arranged. As in the previous department of Architecture and Civil Engineering, so in this, materials would so accumulate in process of time, as to make it possible to construct a map, exhibiting the distribution of soils in the North-Western Provinces, a work at once interesting and useful. Since the staple vegetable products of this country are common to it, and to many distant parts of the earth's surface, it would be of the highest interest and importance, to be enabled to compare the soils sustaining them here, with those from which they may there be produced. Hence these specimens of such soils from tracts producing articles similar to our own, ought to be obtained to as great an extent as may be practicable. The analysis of these might be expected to yield us information as to the peculiar principles on which their adaptation to

particular products was dependent, and might suggest experimental inquiries as to the improvements of our native soils, the results of which could scarcely fail to influence beneficially the general interests of the country. It is to be remarked, that as certain portions of a soil are withdrawn from it for the sustenance of the products reared upon it, so its analysis, to afford the most useful results, ought, I conceive, to be made both before the seed was sown, and after the harvest had been reaped. The results of simple analysis, however, although most important, are by no means the sole requisites for enabling us to compare soils, the fertility and adaptations of these being the effects of many conjoint causes ; as the physical aspect, the atmospheric relations of temperature, moisture, exposure of the districts from which they may be obtained, and also the nature of the deposits from, or the chemical constituents of, the waters employed to irrigate them. In illustration of this last mentioned point, it would I think be advisable, that specimens of soils from districts in the North-Western Provinces should be accompanied by others of the waters of irrigation, whether derived from springs, rivers, wells, tanks, or artificial canals and water-courses. An experimental investigation of them, both as regards the matter held in simple mechanical suspension, or in chemical solution by them, would always furnish us with most interesting information, and in some instances, might enable us to detect the source either of the peculiar fertility or sterility of the soils in certain localities. Specimens of the various kinds of mineral manures employed in this country, and also in other countries, from which it may be possible to procure them, together with those of soils to which they may have been applied with success, would complete, I think, the illustrations of this department of the Museum ; and on being subjected to the same process of analysis as in the preceding instances, might be expected to add, in an important measure, to the information previously collected. It will be observed how essential the aid of the chemical laboratory recommended in a former paragraph, is to the effective illustration of this department, since without it, those researches which promise to cast light upon the principles by which the practical operations of agriculture are influenced could never be undertaken ; nor could we ever expect to replace the empirical rules, by which agriculturists are now guided, and often guided wrong, by general laws induced from

carefully observed phenomena, the only sure foundation on which the philosophy of agriculture can be reared.

9. Since the earths, alumina and silica, constitute the basis of all descriptions of Pottery, from the common earthenware vessel to the Porcelain vase, the rough materials for such manufactures will be found wherever silicious and aluminous rocks prevail. These are by far the most extensively diffused in nature, and there are indeed but few rocks into which the earths above mentioned do not enter in greater or less proportions. From the circumstance, however, that the simple minerals composing rocks of the granitic and felspathic classes furnish silica and alumina, both in greater abundance and more purity than usual, it is from them that materials are most frequently procured for the higher descriptions of Pottery, as Porcelain and China-wares. Thus, the celebrated Kaolin, or Porcelain earth of the Chinese, is simply a result of the disintegration of granitic rocks, and has been found abundantly in Southern India, where these largely prevail, while for the use of the Staffordshire Potteries, immense quantities of Scotch and Welsh granites and felspars are imported. From the geographical extent of the North-Western Provinces, it may be expected, that rocks of the classes above adverted to, will be found in many localities, and from these specimens of the rocks themselves, and of the result of their disintegration ought to be forwarded to the Museum, where an investigation of their properties would be made. But it is not to the mere exhibition of the materials best adapted for manufactures in the different varieties of Pottery, or to the diffusion of information relative to these alone, that this department of the Museum ought to be confined. If we desire to raise the standard of our Indian Pottery manufactures, we must endeavour not only to supply good materials and improved processes of manipulation, but also to correct and elevate the *taste*, by which the use of these is to be regulated. To effect these objects, measures ought to be taken to procure for the illustration of this department, specimens from our English Potteries, exhibiting each successive process in the formation of articles in Porcelain or Stone-ware, from the first appearance of the rough material, to its production in a state fit for use or ornament. Accompanying these, should it be practicable to obtain them, ought to be model representa-

Managements of
the department of
Pottery and Glass
Manufactures.

tions of the apparatus or machinery employed in preparing the material in any of the processes alluded to. Examples also of the varieties of manufacture, selected with the view of their being presented to native workmen as models for imitation, ought also, I conceive, to be procured for this department; in the higher and ornamental descriptions of Pottery such specimens ought, of course, to be chosen as may be distinguished for beauty of design, both in relation to form and embellishment, so that the purest models may be presented for study, and some perception of the truly chaste and beautiful infused, if possible, into the native mind. I would only add on this subject, that the specimens of Indian Pottery exhibited in the decorations of native temples and palaces, display such an extent of knowledge in the simple process of manufacture, and in the nature and methods of applying colouring materials, as to encourage the belief, that were the standard of taste corrected and refined, this improvement would be rapid and important. A series of illustrations of our manufactures in Glass, similar to that recommended for those in Pottery, might be expected to call attention to a department of industry, for which the requisite materials exist in abundance in these Provinces; but which I believe has hitherto been followed only to a most limited extent.

10. Intimately associated with the preceding, as furnishing to the Porcelain painter or Glass stainer, the materials required for the completion of his designs, is the department of Mineral Pigments. This however is by no means limited to manufactures, it extends also to the arts, and to the more common applications of painting, for both of which it furnishes some of the most important colours required. It is only necessary at present to refer, as examples, to the chromates of iron and lead, the various ores of cobalt and manganese, in Porcelain painting, and different departments in glass manufacture; to the pure and impure bi-sulphurets of mercury or vermilion and cinnabar; to the arseniates of sulphur, or red and yellow orpiment, in the arts; and to the sulphate, blue and green carbonates of copper, the colcothar or oxide of iron, sulphate of zinc, in the more common varieties of painting. There is farther, a large class of colouring materials derived from combinations of the foregoing, and others in various proportions, as smalt, from the mixture of the ores of cobalt with silica and potassa,

Arrangements of
the department of
Mineral Pigments
and Dyes.

red, yellow, and green colours from that of the chromate of iron with oxides of other metals. For the illustration of the department of mineral pigments, specimens, therefore, of the various simple pigments, found in nature, and the compound ones formed by art, ought to be procured. When attention has been attracted to this branch of the subject, we may anticipate the development of information relative to native colouring materials and modes of applying them, that could not fail to prove both interesting and useful. With the department under notice, I have associated that of mineral dyes, because many minerals included in the one, belong also to the other. A similar series of illustrations would be requisite for the dyes as for the pigments, and similar results might be anticipated from their investigation as employed in native manufactures.

11. Under this department of the Economic Geology of a country, Department of Mineral Springs. are included the different kinds of mineral springs or waters that may be found in it. These are important, not only as holding in suspension or combination certain mineral products applicable to economical purposes, but also in their scientific relations, and especially in their connection with the geological structure of the district in which they may be found. The occurrence of mineral springs is almost invariably characteristic of the action of disturbing forces, and it is in those districts, where such forces have been most active, that they are found in the greatest abundance. When they are thermal as well as mineral, their interest in a scientific point of view, is much increased; and I may remark, it would be an important contribution to the materials already collected for the investigation of the subject of interior terrestrial temperature, were the thermal conditions of such springs of this class as either have been, or may, yet be discovered in India, investigated with care, and in detail. In the department under notice, are also included those springs of petroleum, naphtha, or the impurer bituminous products which have already been found in several parts of India, and which we may hope to find in the North-Western Provinces also, when the Himalayan coal fields have been more thoroughly examined. Specimens of all mineral springs, whether bituminous, chalybeate, sulphureous, alkaline, saline, or acidulous, that may be discovered in these provinces, ought to be forwarded to the Museum, where they would be examined, and their economic value ascertained.

12. It is unnecessary for me to do more than simply to allude to the department of Mineral Medicines. It has, I believe, in common with the other branches of the *Materia Medica* of India, been carefully investigated by a Government Committee, and it may therefore be concluded, that little difficulty will be found in obtaining such information, as may enable us to illustrate, by specimens, the resources of the North-Western Provinces in this useful and interesting department of the Museum.

13. There are other instances besides those to which specific allusion has now been made, in which geological principles or mineral substances, are made subservient to economical purposes; as an example of the former, the theory and practice of the Artesian method of well-sinking may be mentioned, and of the latter, certain processes in metallic manufactures, in soap-making, bleaching, &c. I am unwilling, however, to extend this memorandum by any details relating to these, since with the exception of the first mentioned, they are of minor importance. The method of boring employed in sinking Artesian wells, has already been adverted to in a former paragraph, and measures for its illustration therein recommended. I would now, therefore, only recapitulate here the several departments with which the measure has been subdivided, and conclude with a few remarks on certain collateral measures to be adopted, for increasing the utility of the institutions. The departments are—

1. Mineralogy,
2. Architecture and Civil Engineering,
3. Agriculture,
4. Pottery and Glass Manufactures,
5. Mineral Pigments and Dyes,
6. Mineral Springs,
7. Mineral Medicines,
8. Miscellaneous.

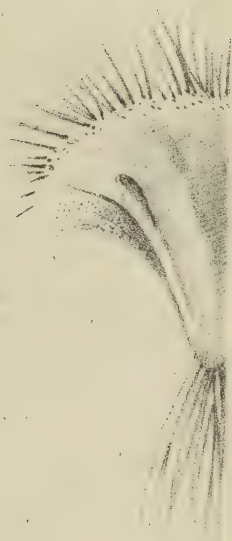
14. In order to furnish specific information to those persons, who may be willing to forward the objects of the Museum, relative to the points to which their attention ought to be directed, it is proposed to circulate extensively tabular forms, or when more appropriate, lists of queries, exhibiting the *desiderata* in each of the preceding departments. Some progress had been made in the preparation of these,

when sudden illness interrupted it. I trust, however, ere long, to be able to submit the series for the consideration of the Asiatic Society. The information obtained by the means above alluded to, ought to be embodied in the periodical reports of the Curator of the Museum, and made public, either directly, or through the medium of the Journal of the Asiatic Society, as may be thought most advisable. It is possible that the Society may be able to render farther aid to the Museum, by transferring to it, duplicate specimens of minerals, rocks, &c. or otherwise to give it such assistance as an institution, which if established at all, will be so by its recommendation, and in immediate connection with it, may be considered entitled to. Those means of illustration in several of the departments, which it will be necessary to procure from England, may, I presume, be obtained through the influence of the Court of Directors, which, by the establishment of the Museum of Economic Geology in Calcutta, has given the strongest proof of the interest felt by it in the subject, and of its willingness to aid practically, its development in this country. By the Curator of the Museum placing himself in communication with learned societies in other countries, much interesting information relative to the economical applications of their mineral products might be obtained, and rendered available for useful purposes here.

15. It only remains for me to add, in conclusion, that from the circumstances under which this memorandum has been prepared, I fear that some points of importance may have escaped notice entirely, and that others may have been imperfectly discussed. Such defects will, however, be rectified by those, under whose consideration these remarks will come, and I will most gladly avail myself of their wider experience, and more extensive information, to correct or extend the views herein expressed.

6th September, 1841.

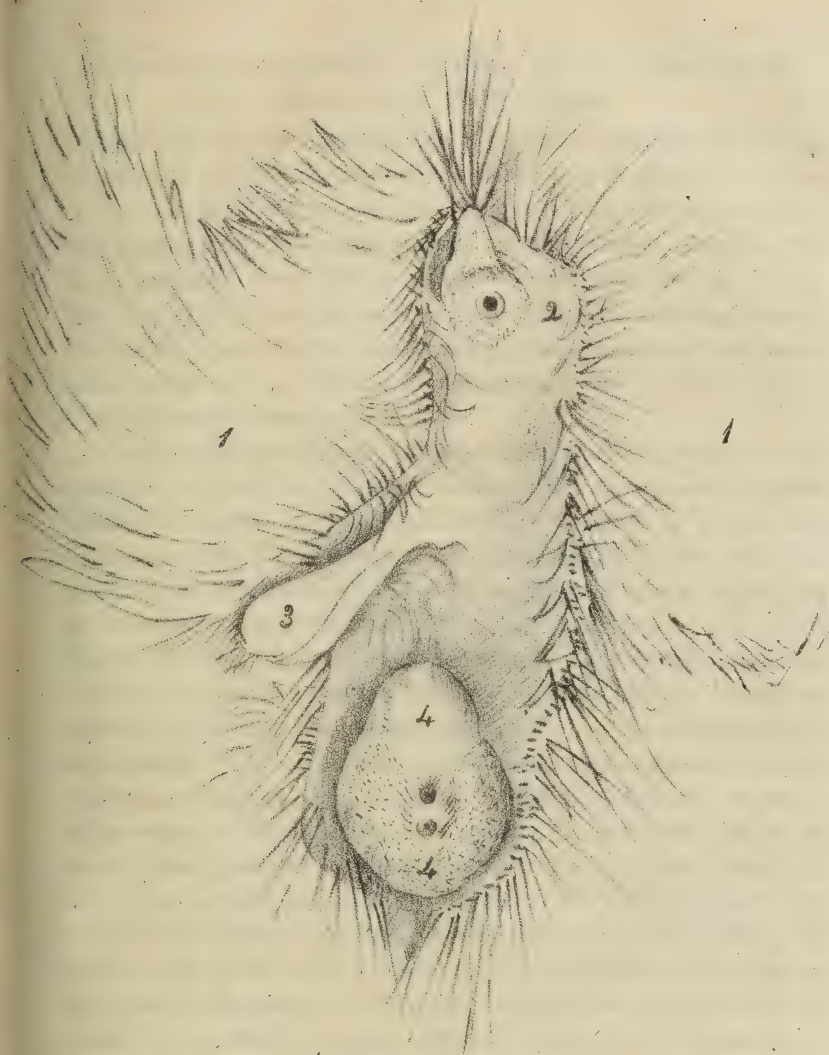
I



*1. Tail from
turned off.*



I Tail from above showing the whole gland and the two pores. hair of rump turned off. II Oblique lateral view of tail with one pore fully revealed



11. insides of distended thighs. 2 tail
 from below & anus. 3 testes. 4. 4 musk
 pod. N. B. the posterior of the two apertures
 between these numerals is that of the penis.
 the anterior, that of the pod.

$\frac{2}{3}$ Nat. Size.

*On a new Organ in the Genus Moschus. By B. H. HODGSON, Esq.
Resident at the Court of Nepal.*

That accomplished naturalist, Mr. Gray, gave, five years ago, in the Zoological Journal, some observations on the Genus *Moschus* of Linn. in the course of which, after remarking that the great Swede's genus was characterised by himself merely by the absence of horns, Mr. Gray suggested some further marks of distinction for the genus. Mr. Gray divided the genus into three subgenera, and discriminates the Musks proper by their coarse pelage, their simple and clad metatarsus, their throats undenuded of hair, and the peculiar pouch in which the musky secretion is found.

Without staying at present to remark upon these diagnostics, it will readily be allowed, that most of them are not so important, but the addition of another decided and organic one must be hailed with satisfaction; and I therefore proceed summarily to describe, what the pencil of my painter has made the description of almost superfluous by the accompanying drawings. The very short tail of the proper Musks has often been remarked on; but it has not been, so far as I am aware, noticed, that this short tail is the seat of a secreting apparatus as marked and peculiar in character, as the celebrated preputial pouch. The tail is rather more than an inch long, and nearly as wide at its base as long, trigonal, depressed, and nude, especially on the upper surface, far *below* it is (like the proximate margin of anus,) partially covered with soft hair. At the very apex, there is a tuft of hair as harsh and quill-like as that of the body generally! and this tuft only is seen in the living animal, the rest of the tail being hid by the hair of the rump. Raise that hair, however, and you at once perceive the real tail, flat-looking, nude, thick, and greasy, whilst around it the hairs are glued together with a viscid liquor, which has become more or less dried and candied here and there. Look closer, and you discern that the whole tail, especially on its superior surface, consists in fact of a hard solid gland, about three-eighths to half an inch thick, which secretes the viscid humour in question, and gives it off slowly, but without intermission, by means of two lateral pores. These pores consist of longitudinal folds of the skin, about as deep as the thickness of the gland, and about three-quarters of an inch long. They are narrowly elliptical in form, possessing thick, rounded, but not very mobile lips or edges, and they resemble in

the general character, the suborbital pits of the Rusa Deer, when periodically excited, or yet more nearly, the frontal pits of the Muntjac under similar excitement; and, lastly, these caudal pores have a basal and marginal position, one on each side of the tail. If you press hard on the gland, the secretion is protruded through the pores in a thick state, like vermicelli; but it ordinarily passes off by the pores in a more liquid state like melted honey, becoming hard and candied as it dries on the edges of the pores. It seems always to be secreted and always to pass slowly off. It has a strong, peculiar, and rather offensive odour, not at all musky; and by its abundance, and the regular apparatus for its formation and discharge, must be of high, though I know not of what, importance to the animal. I noticed it first a year ago, and have since examined it in two other specimens, one live, and the other just dead. The first subject was submitted to Dr. Christie's inspection, who can confirm all that I have stated. My *fresh* specimens of these animals are of the more ordinary and uniformly dark species, called by me, *Saturatus*. But, so far as a judgment may be safely formed from dried skins, the other species, or *Chrysogaster* and *Leucogaster*, possess a similar organ, which therefore would appear to belong to the whole of the Musks Proper. These animals, I may add, are further distinguished by the absence, not only of suborbital and inguinal, but also of interdigital pores, and by hoofs and false hoofs, as long and pointed almost as spikes; not to mention that remarkable pouch, in which the musky substance itself is collected, and of which, as more talked of than understood, I subjoin a sketch, in addition to the ones exclusively dedicated to the illustration of the caudal gland and pores.

B. H. HODGSON.

Nepal, July, 1841.

P.S.—Should this paper fall under the eye of Mr. Ogilvy, I beg to let that gentleman know, that when I published my description of the three species of *Moschus* to which he adverts, I had been long familiar with the ordinary effects of nonage upon the colour of the common species of this genus, of whose parturition and gestation I had, years previously, given a particular account in print.* Mr. Ogilvy's scepticism, therefore, is not better founded in this instance, than in some others, as he must pardon me for saying.

* Vide Gleanings in Science.

Extracts from a Report on subjects connected with Affghanistan. By DR. GRIFFITHS, communicated to the Editor, from the office of the Political Secretariat of India.

Forests.—The nearest wooded part of the Sufaid Koh to Cabul is Taizeen, a distance of three marches, including, at least by the common route, a steep pass, the Huft Kothal, some 3,000 feet in height. In the direction of Cabul, there does not appear to be any water-carriage available for the transport of the timber of the Sufaid Koh. Cabul may therefore be said to be in a considerable measure beyond the reach of an efficient supply of good and durable timber.

Candahar and Ghuzni may be said to be absolutely beyond the reach of any indigenous supply, no forests occurring within any practicable, if within any distance. The forests of the Sufaid Koh consist of various kinds of Fir, among which the Deodar is abundant; the Cheel or *Pinus longifolia* also I believe occurs, as well as the Chilghozeh, which from the abundance of the seeds, sold or exposed for sale, must be common. The seeds of this appear to resemble exactly the seeds of the Kunawur *Pinus Gerardiana*; it will be interesting to ascertain whether the trees are identical; if so, it will not be the only instance of affinity between the Floras of the two countries. These forests likewise contain the Baloot, a species of Oak; the Zaitoon, a species of Olive; the Sehnee, and two or three others. I am not personally acquainted with the trees of this range. Captain Burn, commanding the Khybur rangers, one of the few who had ascended the lower ranges, informed me, that the Baloot and long-leaved Fir were common. The chief tree on the Taizeen ridges is the Deodar. It is very unfortunate, that from this great range, there does not appear to be available water-carriage in any direction, at least to the northward. The only forests, with which I am tolerably acquainted, are those about Olipore, in which direction the mountains, as I have more than once observed, assume the Himalayan features. The principal trees of these mountains, always excepting the neighbouring ones of Kafiristhan, are the Deodar or Nokhtur, the Zaitoon, and the Baloot. There is perhaps another species of Oak, but, so far as I know, there is no other Fir tree. The distribution of the forests may be stated as follows: the Baloot ranges from the bed of the river to an elevation of 2,000 feet above it, or 4,500 feet above the sea. It commences to be mixed with Zaitoon towards its upper limits; and is

soon supplanted by it, the Zaitoon forming the chief, if not the only part of the forests, as far as the lower limit of the Deodar, at an elevation of 6,500 feet above the sea.

Between this and the summits of the ridges which attain a height of about 10,000 feet, the Deodar rules supremely vast in abundance and in size. These forests may be considered as available for Jilalabad and Peshawur.

As the valley of Olipore is very narrow, and the lowest, which is a considerable one, sweeps in many places under the Oak forests along its right bank; this timber could be supplied effectually.

The tree, however, does not reach any size near its lower limit of distribution. Greater labour, and a proportionally greater expense would be required to supply the two others in proportion to their distribution.

There is perhaps but little prospect of the country about Jilalabad arriving at much importance. A small supply of timber may be demanded by Europeans, but Jilalabad, from its extreme heat, can scarcely become their residence except for the winter months.

The forests of Olipore are therefore of comparatively little use, and will probably remain so, until Peshawur assumes its real importance. The want of timber about Candahar, though not, if I recollect rightly, in the city itself, is remedied by the construction of the houses, which are generally domed. The houses of Cabul are extremely slight, built of mud and small timbers; these are supplied exclusively almost by the Poplars, which are planted in many places along the banks of the Logor and Cabul rivers, by which they are carried towards the city during the floods. This timber is white, and very soft; it does not enjoy fair chances, for the trees are planted so close together, that they not unfrequently grow together, and they are cut prematurely.

They are quite unfit for building purposes, and some idea may be formed of their perishableness, when it is said that Cabul is renewed once in every 25 years.

I have already mentioned that the great majority of the cultivated

The only other trees besides the fruit trees known to me, are three or four kinds of Poplar, three or four of Willows, and the Hawthorn. In Baben's garden, there are many very fine Poplars.

trees are fruit trees; these are for many reasons not available for the purposes of timber.

The great bulk of the vegetable fuel is supplied by the low bushes, chiefly species of *Artemisia*, that occur commonly in the barren parts of the

country. They are not good fuel, except perhaps for particular purposes, having no bulk, and burning very rapidly. They are, I believe, chiefly used by the bakers, and the loads, carried generally on asses, constitute not one of the least nuisances of the crowded and confined streets of Cabul. From Taizeen supplies of Baloot branches are brought to Cabul, as well as a good deal of charcoal prepared from it and the Deodar. But the price is enormous. I have heard officers say, that the daily expense for fuel, during the severity of winter, was not unfrequently three rupees.

Nevertheless, the experiment might be tried with some of the indigenous trees, on the better parts of these same slopes. Attention should, I think, be chiefly directed to the Baloot, which is the only tree that has striven to establish itself on the barrenness of an Affghan mountain. The Zaitoon and Deodars of Olipore cease abruptly, the Baloot struggles on from Koonur to Taizeen.

The growth of the timber trees now cultivated should be discouraged as much as possible, as soon as efficient European timber trees have been introduced. This may be a matter of time, but scarcely of difficulty, considering the state of perfection the overland interchanges of seeds between Drs. Royle and Falconer. I have appended to the report a list of the various desiderata.

In all the lower parts of the country the best of the timber trees of the dry plains of the N. W. might be introduced. In such parts as about the Koonur valley, the Sissoo is occasionally met with; to it the Seriss, Jamun, Kikhur, &c. might advantageously be added. Around each of the main places in the country, small plantations might advantageously be made, particularly of such timber trees as are best adapted for the purposes of military arsenals. Thus at Jilalabad and Candahar, the Sissoo might be planted with reasonable prospects of success; for the supply of Cabul and Ghuzni we must look to Europe and the Himalayahs. At present I know, it is next to impossible to repair or construct properly a gun-carriage; the Plane tree is the only available one, and besides not possessing even ordinary merit, is procurable with difficulty. I cannot offer any particular suggestion towards supplying Candahar with fuel; with regard to Cabul, I may be allowed to suggest a comprehensive survey of the Taizeen forests, and of the other wooded portions of the Sufaid Koh in that direction; particular

respect being paid to their communications with Cabul. At present the line of road for any beast of burden, but a mule or a donkey, is very circuitous and arduous. The dealers in wood and charcoal, however, instead of turning the range which forms the south boundary of the valley of Cabul itself, cross it near the place where the large Bactrian pillar, now called Baber's Pillar is situated; by this they *debouche* immediately into the valley of Kooro Cabul, saving a circuit of several miles, and preferring shortness and great steepness, to length and comparative levelness. A new line might possibly be marked out. The grand remedy will be found when good and accessible coal shall have been discovered; this is one of the greatest desiderata, and search for it should be proportionally encouraged.

Affghanistan is a country of mountains intersected by vallies, or as
 Physical features of Affghanistan. some may perhaps be called, steppes. It appears to me to possess many peculiarities, and my limited experience cannot suggest a country, with which it may fairly be compared. A popular general idea of it may be formed by imagining, the upheaving of an extensive and varied system of mountains, through an enormous plain variously covered with boulders and shingle, and presenting here and there deposits of soil, generally in the shape of narrow strips along the principal lines of drainage. The general form of the country as now limited, may be compared to that of an equilateral triangle. Its boundaries are undoubtedly the Indus along the Southern line; the Koh-i-Baba, Paropamisus, and Hindoo Koosh along the North-Eastern; Persia, Seistan, and the territories of Khilat along the Western.

Of the above-mentioned boundaries, those of the North-Eastern and Southern or South-Eastern sides are natural in the strict sense of the term; those on the Western sides are badly supplied by the changeable and arbitrary boundaries of Beloochistan and Persia.

The mountains may, I think, be said to belong to two great systems, that of the Hindoo Koosh, Koh-i-Baba, and Paropamisus, which appear to be nothing but different parts of the westerly continuation of the great Himalayan chain, and the Sufaid Koh. This is, however, connected with certain of the extreme southerly offsets of the end of the Himalayas, or beginning of the Hindoo Koosh. To one or the other of these systems all the subor-

dinate ranges may, I think, be traced: although I have no personal acquaintance with the countries between Candahar and Ghuzni, and the Southerly prolongation of the Sufaid Koh. The true mountain, Hindoo Koosh, for this name has been laxly applied to the whole See Burnes' Travels. range, is situated nearly due north of Cabul. I have no personal acquaintance with it. The higher peaks of this chain always present traces of snow, and are visible from some points about Cabul. I am not acquainted with the exact point in which the Himalayas assume the name of the Hindoo Koosh; but I have grounds for believing, that the features of the Himalayas are not changed at Olipore, Lat. $34^{\circ} 54' 38''$ N. Long. $70^{\circ} 12'$ E. The Kohi Baba is a direct continuation of the Hindoo Koosh, from which it appears to be separated at first by the Kaloo torrent, and then by the united Kaloo torrent and Bamean river. On either side of these lines, which appear to be the deepest lines of separation, numerous and very varied offsets from both ranges occur. It is over these intermediate portions, that the best routes to Bamean pass, the highest point traversed, is the Erak pass, which reaches an altitude of 13,000 feet. But the best route, one which is said to be more easily practicable for artillery, and open throughout the year, is through the country of the Shaikh Ali Huzaras, this probably does not pass over ground exceeding 9,000 feet in altitude.

The eastern end of the Koh-i-Baba, or its commencement, is certainly grand; a magnificent view of its three snow-clad peaks is enjoyed from a pass between Yomurt and the Helmund river. Its extreme eastern part shews itself in the form of a vast rounded mass on approaching it up the Siah Sing torrent; but to the west, it rapidly assumes a different appearance, presenting a succession of lofty peaks, as far as the eye can reach. In this direction it loses itself, and I believe becomes diminished in the Paropamisus. Snow exists on its eastern portion throughout the year; in sheltered places it occurs in beds of considerable size.

In August 1840, I ascended this range near Kilah-i-Kaloo, up to 13,500 feet. No change in the usual features occurred, but from that altitude the ascent became much steeper, and was rendered much more difficult by the ruins of enormous slips.

With all my endeavours I was only able to reach the general level of the connections of the peaks; these were completely inaccessible,

the nearest did not appear to be more than 1,000 or 1,500 feet higher than the spot on which I stood. Patches of snow commenced about sheltered situations at 13,500 feet, and towards the summit beds occurred, except in the most exposed spots. The upper portion of the range appeared entirely bare, the surface consisting of nothing but angular fragments of the rock, of which the peaks are composed. The snow in the upper beds was wrought, if I may so express myself, by the action of frost and thaw into pinnacles, which during sunshine, presented thousands of glittering objects. The few plants found above 13,500 feet were different from any that I had met with elsewhere; the only animals observed were a large hare, and a covey of the snow grouse, Koki-i-dusrah of Affghanistan, the Tehoo or Gallus Neillii of Mr. Gould. The general character of the Koh-i-Baba is great barrenness, this it shares, I have been told, with the Hindoo Koosh, and generally with the Paropamisus, of which portion I have not much direct knowledge. To these three ranges, the Hindoo Koosh, the Koh-i-Baba, and Paropamisus, and perhaps with the western extremity of the Himalyas Proper, I should be disposed to assign all the ranges to the north of the valleys of Peshawur, Jilalabad, Cabul, Ghuzni, and Candahar.

The Sufaid Koh, or Espeen Gar, which in Pushtoo has the same signification as that of the Persian name, is perhaps as lofty as the Kohi Baba, and like it, although more exposed to the effects of heat and the influence of the great plains of India, presents traces of snow throughout the year. This range is seen to perfection from the valley of Jilalabad, the southern boundary of which it forms. It is continued directly, I believe, down in line with the right bank of the Indus as far as Beloochistan, regaining, as far south as the Tukht-i-Soliman, a considerable portion of its loftiness. The Sufaid Kohi is by no means uniformly bare, as is the case with the previously mentioned mountains; many parts of the southern boundary of the Jilalabad valley are covered with Fir forests. Similar forests occur on other portions, such as those about Taizeen. Fir trees also occurred on certain parts of the return route of the Bombay Army, as I was informed by Lieutenant Marriott, of the Bombay Engineers.

To the Sufaid Kohi, I am disposed to refer all the ranges along the right bank of the Indus, as far perhaps, or farther, than Brahooistan,

and all those to the east or south-east, or south of Cabul, Ghuzni, Candahar and Quettah.* Of the mountains of the Khilat territory I have no personal knowledge, nor do I know to what system of mountains they are approximately referrible. On surmounting the crest of the Kharlekhir pass, peaks of considerable altitude covered with snow, at that season at least, were seen to the south.

A high mountain, Chiltern, rivalling Tuchatoo in height, towered over the valley of Quettah to the south-westward of the town, but with what chain this was united, I do not know. It will be readily seen, that this grouping of the Affghan mountains is only approximate, if even this much share of truth can be claimed for it. Mountainous systems, like all others, pass into each other by numerous ramifications: an intimate knowledge of which is only to be attained by close and extensive acquaintance with the features of the country.†

I have before alluded to the barrenness of the Hindoo Koosh and Koh-i-Baba; this is a general characteristic, equally affecting their low offsets and the culminating ridges as far as an altitude of 15,000 feet. This barrenness may be said to be comparatively absolute; that of the barest portions of the lower ranges of the Himalayas between Bhar and Simla is rich and luxuriant clothing, compared with what occurs in Affghanistan. Of the structure of these mountains, I regret not being competent to give an account. Very generally their surfaces are immediately rocky, except in some of the offsets, interposed between the Sufaid Koh and the ranges derived from the Hindoo Koosh, towards the western end of the valley of Jilalabad. There they are composed of sand, in all degrees of softness and induration, in which last state it becomes tabular. Alternating layers of a conglomerate, often exceedingly hard, are to be met with in this sandstone. Exceptions also occur in the valley of Bamean, on both sides of which the offsets are composed of earthy or clayey materials of varied and rather vivid colours. Generally speaking, the Affghan mountains did

* It is this range that will best repay the trouble of future botanical investigations. Its isolated situation, and its elevation as well as prolongation to the southward, invest it with peculiar interest. From a few specimens brought to me at Khaffal, I apprehend its Flora will approach to that of the Himalayas.

† The appearance of the highest ridges and peaks of both these chains appeared to me to resemble such as I had seen in the far more magnificent Himalayas.

not appear to me difficult of access; in this respect they are widely different from the other mountains I have traversed. It was found to be a general feature, that they might be ascended and descended, by making use of the beds of the draining streams which are very generally dry, except in the season of floods. These ravines, are gently inclined planes, the steep ascent only commencing on reaching their heads; and this perhaps in no instance exceeds 1,200 feet.

A section of an Himalayan ravine may be, I think, correctly taken as wedge-shaped ∇ , that of the Affghanistan ravines would be a broadly truncated wedge \sqcap . The base line of an Himalayan ravine is again a succession of steps, with intermediate, more or less level spaces; that of an Affghan ravine is an uninterrupted inclined plane. The bottom of an ordinary hill ravine, again, is generally choked up with fragments, torn from the sides, or by boulders of various sizes rolled down from various distances. The bottom of an Affghan ravine may be in contra-distinction stated, as being almost evenly strewed with moderate sized boulders or shingle.

The vallies, enclosed by these mountain ranges and their innumerable offsets, vary much in altitude, and a good deal in nature, and have been formed perhaps by two different causes.

I am unable to state whether they usually present any definite direction with regard to the mountain ranges, except on the southern face of the Koh-i-Baba, in which direction they are, in the usual manner of the Himalayas, parallel to the chain.

The ordinary form of these valleys is generally very narrow, the tillable soil is confined to a narrow strip along the line of drainage. The space between this portion, and the bases of the outcropping boundary hills is an inclined plane,* strewed over, and indeed entirely formed of boulders and shingle, generally without a particle of soil. These slopes, very aptly termed by that talented officer Lieutenant Durand, of the Bengal Engineers, glacis slopes, appear to my limited experience, characteristic features in the physical configuration of the country. I beg to subjoin a rude attempt at a sketch of a very

* Without personal knowledge of the country, it is almost impossible to imagine the extent of these glacis slopes, and the enormous proportion they have to that of the tillable soil.

marked one on the left bank of the Cabul river, below Jilalabad, and opposite the village of Chardeh. As instances of these vallies, I may cite the valley of Shawl, which is not however characteristic; the valleys of the Wighand at Turnah; of the upper parts of the Cabul river; of Jilalabad, and of Koonur. In the only vallies of the Toorkistan face of the Koh-i-Baba, with which I am acquainted, these glacis slopes are not developed to any extent.



Characteristic Affghan scene north of Chardeh, shewing the glacis slopes, the undulated lower ranges, and the frequently isolated hills.

The other form of valley, to the existence of which the country is almost entirely indebted for its agricultural produce, are of considerable width, their bottoms are apparently almost level, and entirely covered with tillable soil, except towards the boundary hills along the bases of which glacis slopes very generally occur. Their principal distinction rests therefore on the amount or extent of tillable soil, the proportion of which is reversed in the two forms. As instances of these, I may adduce the valleys of Peshawur, of Candahar, and the vicinity of Cabul, and perhaps the whole line of country between Mookhloor and Nannee, near Ghuzni. Perhaps the best marked instance is the valley to the immediate west of Cabul.

The formation of some of these valleys is easy, and it appears to me naturally explicable by assuming their having been the beds of inlaid lakes. By this assumption it is, I believe, that Dr. Lord has explained the formation of the vallies of Cabul, Jilalabad, and Peshawur, in Dr. Lord's report or account of the Koh-i-Daman, *Journal of the Asiatic Society*, June 1838, will be found some geological speculations, to which I, although not professing any acquaintance with geology, beg

leave to object. The three vallies, cited by Dr. Lord, as having been once large basins, do not, as they now exist, present that amount of similarity of features, or, in other words, of affinity, which chiefly authorises us to ascribe formations to similar agencies. And the only one which, it appears to me, is naturally explicable by the hypothesis of Dr. Lord, is that of Cabul, which presents a tolerable level surface surrounded in every direction by hills. It may even now be said to be a marsh. The valley of Jilalabad presents soil, such as may be imagined to have been a deposit from tranquil water, only along the course of the draining river, which, as Dr. Lord correctly mentions, hugs the northern edge.

Between Bala Bagh and Pigdulluch, which looking to the boundary mountains, appears to me to be the western extremity, or part, rather of the valley ; it is, if I may so express myself, blocked up by a low series of sand hills and the table land of Gundamuck, from which there is a descent again, over other sand hills, to Sooikhab.

The space between the southern bank of the river and the Sufaid Koh, or southern boundary, is occupied by an enormous glaciis slope, intersected by the northern draining torrents of the range, along and about which, here and there, small and generally well cultivated valleys occur.

If the great valley of Jilalabad, therefore, had ever been occupied by a grand sheet of water, or if it ever presented in other words the features that now characterise the valley of Cabul, great changes must have subsequently occurred.

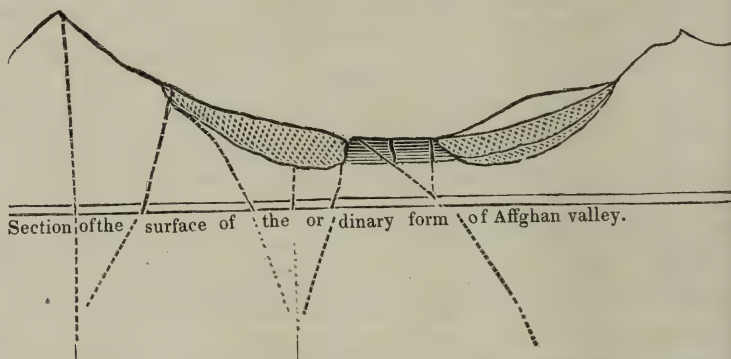
The Khybur pass which was selected by Dr. Lord as the exit to the "mighty rush of waters," did not appear to me to present any greater evidence of unusual water action than did any of the other characteristic passes of the country. Neither can I omit observing, that the assumption of the necessity of more energetic means in former times to enable nature to carry her measures into execution, is not consonant with those modern doctrines which believe, unless I am mistaken, that the causes now in operation in modifying the surface of our planets, are fully competent. The valley of Peshawur, as it now exists, is open freely towards the Indus. The Greedur Galli is a small ravine, presenting fewer traces than usual of the action of water, affording an easy cut across a spur of the

Afredi range, which forms the south-east boundary of the valley. If the water of the great basin selected this as the direction of the least resistance, that part of the valley now open towards the Indus must have since undergone depression. Dr. Lord supports his hypothesis with considerable ingenuity, but he has omitted to observe, that the rolled pebbles of Jumrood are not limited even to the most extensive allowable sphere of action of the rush of the waters of the Jilalabad basin, but form a well-developed belt or glacia slope all round the bases of the boundaries of the valley. Nor does Dr. Lord mention that boulders, constituting glacia slopes, exist on the west side of the Khybur pass, from its mouth to the Cabul river at Dhukka, that is, on the side of, or in that which he assumes to have been, the great basin. If the boulders and shingle, composing these vast extents of glacia slopes are found to have been constituent portions of the ranges of mountains, their formation is, I think, naturally explicable, by the agency of floods, which are no doubt frequent and severe during the spring months. The intimate mixture of the boulders and shingle, by which I mean smaller water-worn stones, which may be observed even to the rather sudden transition to the tillable soil, may be explained perhaps by allowing great inequalities in violence of the floods. But I think I have more than once seen these water-worn stones and boulders lodged on the sides of mountains in situations which would not, as it appears to me, warrant us in the invariable adoption of such an agency, unless I am mistaken. I might especially refer to the sand ranges about Gundamuck, on which, unless my recollection fails me, boulders are abundantly strewn, and which could not have been brought to their present situation by the action of water. It would be, however, useless to speculate further on a point which a practised geologist would determine at a glance. I fear that I have already infringed the principle, that no one is authorised to remark on things he has not studied.

I return to my impressions on the physical features of Affghanistan. This country is also, I think remarkable, always keeping in view that I write, drawing my comparisons from India, the country with which I am better acquainted than any other, for the smallness in number and size of its rivers and streams. From the general dryness of the Rivers and Streams. climate, perhaps many springs cannot be expected, and the summer supply will be almost entirely confined to the streams,

which drain the loftiest ranges on which snow is to be found throughout the year.

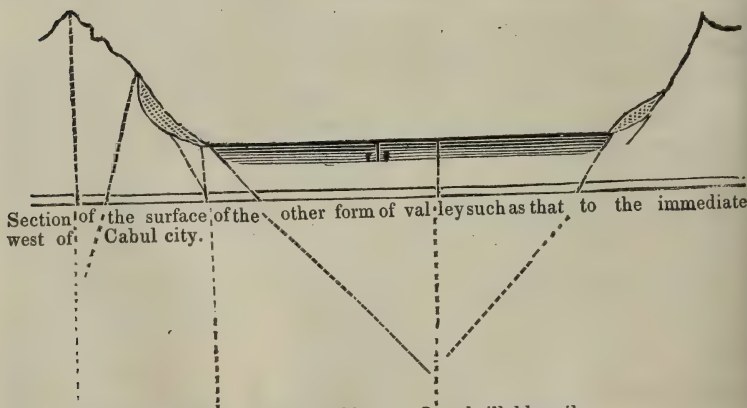
In most of the mountainous parts of India, I have seen almost every ravine give exit to a water-course, but this is not the case in *Affghanistan*. In the Bolan pass water is plentiful enough, and at Sir-i-Bolan, which the *Affghans* consider as the head of the pass, a beautiful and copious spring gushes from the rocky southern side of the gorge. But from this to Sinab, a distance of about 24 miles, and where there are *kahreejees*, not a drop of water is procurable, unless rain has very lately fallen.



Boundary mountains
usually bare rock.

Glacis slope of boulders
and shingle.

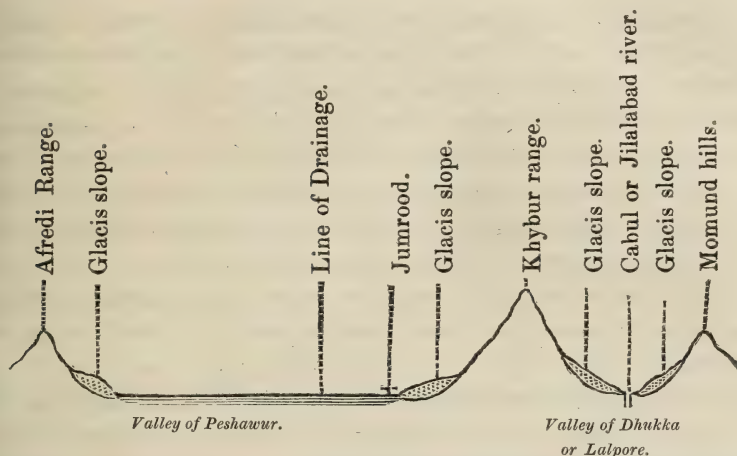
Tillable soil, a strip on either
side of the line of drainage.



Rocky boundary
mountains.

Glacis slope of boulders
and shingle.

Level tillable soil.



Superficial oblique section (not drawn in proportion) of Peshawur valley, of the Kybur range, and valley of Dhukka, to shew that glacis slopes of boulders and shingle exist in the Afredi, as well as the Kybur side of the valley, and as well on the West as on the East side of the Khybur range.

The Kojuck pass is much less supplied; there is a good spring near the head of the ravine up which the road runs, and there is also some water at Chummun, on the north face of the range, 3,000 feet below its crest. But between Chummun and Kelah Abdoolla, no good water is procurable, and even at the last mentioned place the supplies obtained were brackish; the same comparative scarcity occurs in the road to Bamean, above Sir-i-Chusma, and it is only when one arrives within the drainage of the Helmund, that most of the ravines present small supplies of water in the Khybur pass. There is no water until Sundyck-hara is reached; the bed of the ravine by which the army descended from Lol-Ghurree Beg, was found to be dry to within one mile of Ali Mussid, at a place called Sir-i-Chusma, where there are copious supplies from a sort of cavernous limestone. Indeed, this rock seems to be the principal source of the perennial waters of the country in those parts beyond the influence of the melting of the perpetual snows. It is the source of the supply at Sir-i-Bolan; at Mookloor, or the head of the Turnuk; at Sir-i-Chusmah or the head of the Cabul rivers; and the place of the same name I just mentioned as occurring in the Khybur Pass. I, whose journeys had been confined to the North-eastern portions of British India, was particularly struck with the small number of natural

springs. On this depends, I am disposed to think, though perhaps in a secondary point, many of the peculiarities of Affghan vegetation. But few as springs are, and few as streams are, the effect is heightened by the quantities of water expended in irrigation. To this, and in a greater degree to great absorbent powers of soil, is to be attributed the not unfrequent occurrence of the actual disappearance of the streams in Affghanistan, at various distances from their sources. This may be observed both in the Kojuck and Khybur passes.

Before remarking on the only two rivers in the country worthy of any detailed notice, some observations on the lines of drainage may be necessary.

The main lines are two, one easterly, towards the Indus, the other westerly, towards the lake of Seistan; of course in both cases there will be many minor modifications.

After crossing the Bolan range until one arrives within the influence of the Logur, between Ghuzni and Cabul, all the streams observed flowed westerly. From the point mentioned all flowed easterly, and perhaps a line drawn due north from near Sharkabad to the crest of the Koh-i-Baba, will describe the approximate direction of the division of the two lines of drainage now alluded to.

The chief river of Affghanistan is the Helmund, the principal feeder of the celebrated Seistan lake. This river has a course of perhaps 400 miles, and arises in the southern face of the eastern portion of the Koh-i-Baba, or western of the Hindoo Koosh. I have only seen it towards its head, at an elevation of 11,500 feet; it is at Girdun Dewar, where it is crossed going to Bamean from Cabul, by a small river, knee-deep in the cold weather. At Girishk, the Helmund is a large and a rapid river. I am not aware whether this river is ever made use of for the purposes of descent; the only use, so far as intercourse is concerned, that the collected waters of so variously levelled a country can be put to. But connected with the small distance of Girishk from Candahar, (40 miles,) the valley of the Helmund is worthy of being surveyed, with a view of ascertaining its mineral resources. Connected too with the subject of wool, its capabilities of affording a rapid means of descent to within 40 miles of the second place in the country should not be lost sight of, more particularly if any of the upper parts of the valley are great sheep resorts during the shearing season. Were

there any reasons for supposing that forests of any description existed in the same direction, an enquiry would be still more necessitated.

The only other river I shall notice at much length is the Cabul river, by which name the large body of water that falls into the Indus just above Attock, appears to be generally known. This river has its chief origin from a copious spring at Sir-i-Chusmah, about 37 miles to the east of Cabul. It drains the well cultivated Mydan valley, but is quite insignificant until it joins the Logur in the valley of Cabul, and even here it is easily fordable. On leaving the valley of Cabul, it enters a mountainous district through which it continues to flow, until it emerges into the valley of Jilalabad, near Baler Bagh, where it receives the Soorkhab, a considerable tributary arising in the Sufaid Koh.

At Jilalabad, the Cabul river is of considerable size, and of a mountainous character; two or three miles below Jilalabad, it is joined by the large river which drains the Koonur valley, and which is known, I believe, by the name of Rania in the lower parts of its course, and of Koonur in the upper. The Cabul river then ceases to be fordable; it continues to hug the northern side of the Jilalabad valley, until it enters the Momund hills, which connect the offsets of the Sufaid Koh with those of the Hindoo Koosh, or western parts of great Himalaya, at the Abkharah, a few miles below Dhukka.

It continues to be confined by these, until at Mucharr it emerges into the valley of Peshawur.

From Sir-i-Chusmah to Jilalabad, this river is of no importance except agriculturally. But from Jilalabad to Peshawur it assumes an additional importance, by affording means of safe, and generally rapid descent. For this purpose it is navigated by rafts, floated on inflated skins, the only mode resorted to by the Affghans, except at Lalpore, where the ferry is carried on by means of one large boat. These rafts are perhaps the safest possible conveyance, and are admirably adapted to such rivers as those of Affghanistan. They are very buoyant, and some of the skins may be burst without causing danger. Indeed, if care be taken in properly securing the frame-work, a serious accident can scarcely occur.

Descent by this river is a good deal resorted to, especially when the Khybur pass used to be disturbed. It saves a distance of ten marches,

and when the Indus becomes a channel of greater traffic, it will be probably by this route, that most of the exports will leave the country ; for the rafts would experience no difficulty in proceeding to Kalabagh, and there discharging their loads into the boats of the Indus. The rafts would then have to be broken up, and the skins to be carried in a collapsed state to Jilalabad for a fresh journey. During the floods, the distance between Peshawur and Jilalabad may be traversed in 12 hours, the distance by land being about 100 miles.

The Koonur River deserves considerable notice from being similarly navigable, and from the forests which occur along the tributary which passes Olipore, and falls into the Koonur river at Chughar Serai Pareen. It presents the most feasible plan of supplying Jilalabad, and especially Peshawur, with fine timber and good fuel. The Olipore branch of the Koonur river comes, I believe, from the more western parts of Kafirsthan ; it is a large torrent, and is crossed by wooden bridges, on the same principle, but of much worse construction than those of Bootan, or by beams thrown across.

At Chughar Serai Pareen, where it is rather more gentle in its course, it is fordable with some difficulty in the cold weather. The main branch, which drains the little Chughar valley, is perhaps the larger of the two ; united they form a stream which I think exceeds rather in size the Cabul river at Jilalabad. Both these rivers practicable for descent, may possibly come into considerable play, should any great stimulus be given to the wool trade of Affghanistan ; the low tracts along both being frequented in the cold months by the flocks of the Nomadic tribes.

The waters of the Arghandab and Logur, are chiefly used for irrigation ; by the latter small poplar timbers are floated during the floods for the Cabul consumption. The Arghandab passes Urghandab and Logur. within three or four miles of Candahar, and though fordable, is a stream of some size. The Logur passes within a short distance of Cabul ; it is scarcely as large as the Arghandab. It is in the direction of these streams which may be descended during the floods by rafts, that search for coal or any other valuable mineral product should be encouraged. Timber is, I fear, scarcely to be expected. Both these cities would double their importance, should coal mines be found within the range of either of the above rivers.

The only lake in the kingdom of His Majesty Shah Shoojah known
Lakes. to me, is that of Cabul, which is of some extent. I am not aware of its being of any other use than supplying the market of Cabul with water-fowl, and ice during the winter, and affording in the same season healthy recreation to Affghans and Europeans.

Of Hurmal, or chalybeate springs, I observed only two ; of these the
Springs. most striking one is a chalybeate on the Siah Sing torrent, in the direction of Bamean ; it is perfectly clear, and emits copious bubbles, depositing copious sediment of red powder, by which all the turf and plants around are covered. The Hurmal springs, if they can be called so, occurred at Gurmah ; of three examined by Dr. Henderson of the Sappers and Miners, the hottest had a temperature of 81° and 82°. Small salt springs do not appear to be uncommon in the valley of Bamean, but are not, I believe, put to any use by the natives.

Having thus attempted a sketch of the physical features of the country, I pass to another great natural feature, the absence of forests.

It is only eastern Affghanistan that possesses forests. From Dadur to Tanjeen, three marches from Cabul towards Jilalabad, nothing wild, worthy of being considered a tree, was to be seen by the Army. An involuntary exclamation of surprise escaped me, on reaching the crest of the Huft Kotul pass, from which the fir-clad ridges above Tanjeen are visible.

The Bolan pass, beyond a few miserable Rairoo trees* may be said to be absolutely devoid of arboreous vegetation ; some pollard-looking Sehnee trees exist in the ravines of the Khojuck range, elsewhere not only are these absolutely wanting, but there is nothing like luxuriant shrubby vegetation. The forests of eastern Affghanistan are limited to the Sufaid Koh and to the Sub-Himalayas north of Pusheet and around Olipore, lat. 34° 54' 38," long. 70° 12'. On both of these mountain chains, firs, Zaitoon, and oak forests are common. Other forest trees occur on the Kafir mountains within a few miles of Olipore ; of these the two most striking are the horse chesnut, and a beautiful abies or spruce fir, apparently allied to the Morinda or Khutrow of the Himalayas. These are only known to me from specimens purchased from the Kafirs.

* Acacia ?

The transition from the absolute barrenness of the Hindoo Koosh to the finely clothed Himalayas, certainly takes place somewhere to the north of Pusheet, or between it and Jugdalluck. It would appear to be almost sudden, both firs and the Zaitoon ceasing abruptly; the Baloot only straggling as far as Jugdalluck, about which it is a stunted tree, very much like a holly. During my stay at Olipore, I was of course anxious to ascertain to what causes the general barrenness of the Affghan mountains was to be attributed. - Independently of consideration of climate, a primary cause appears to me to exist in the want of soil. Tillable soil exists on the mountains around Olipore, which are consequently inhabited, and partly cleared. That soil is rich, and of considerable depth, the bare rock being only exposed where the inclination of the strata approaches so near the perpendicular, that no lodgment of soil can take place.

The bare mountains, however, present very different circumstances; they are almost entirely, or quite, devoid of soil, rocks project in every direction, the intervening spaces being strewed with angular debris by no means sufficiently comminuted. These mountains are never cultivated, and sustain nothing but arid-loving thorny and aromatic species, which almost invariably occur solitarily.

The Sufaid Koh is the range best calculated for the complete investigation of the extreme inequality in the distribution of forest, for it unites in many places the characteristic features of both series of mountains, and it is this circumstance which leads me suspect, that the bareness is in some measure independent of climate.

The matter is of some importance connected with any attempt that may be made to improve this deficiency in the dominions of His Majesty Shah Shoojah.

On the climate of Affghanistan I am not able to present any details,
 Climate. such being only compatible with a residence of some continuation, as in all mountainous countries a great variety of local climates will be found to exist.

The general peculiarities, as compared with North-western India, are the confinement of the rainy season to the winter and early spring months, and the great dryness of the remainder of the year.

The peculiarity of the climate of the higher districts is excessive winter cold; of the lower, excessive summer heat. Even at Candahar,

which is in lat. $31^{\circ} 35' 33''$ and at an elevation of nearly 3,500 feet above the level of the sea, the direct heat of the sun in May and June cannot be much less than 125° to 130° . Throughout the lower districts, during the hot months, westerly winds, often assuming the character of hot winds, are prevalent.

They were very incommoding at Candahar, and were rendered very hot from blowing over a desert of some extent, a short distance to the westward of that city. In certain places, these winds become quite deadly; their fatal effects have been especially experienced in Kutch Gundava, but they are dreaded by the natives in some parts of Affghanistan itself, as on the stony desert between Ali Baghan and Chardeh, near the valley of Jilalabad. In such they are I believe, known by the name of Badi Simoom.

Little or no dew is deposited in Affghanistan except in the spring
Dews. months, and in those places, such as the Chummun, where the water is very near the surface, and along the immediate vicinity of the lines of drainage.

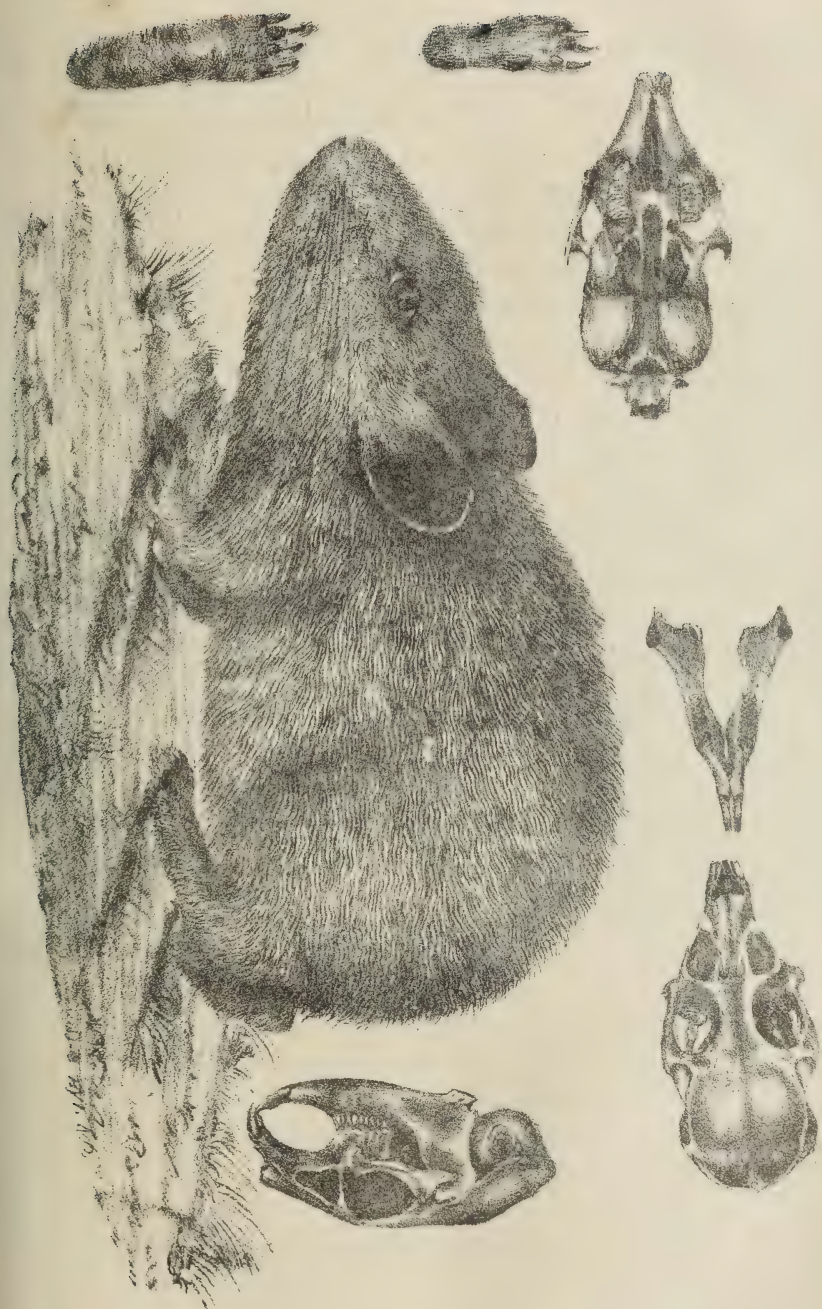
I have seen it mentioned in books of some authority, that dews are the providential means by which plants are supplied with moisture in arid countries. To this opinion I do not subscribe; it certainly does not apply to Affghanistan, as I had opportunities of observing during the marches of the Engineer department. If the deposit of dew depends on the presence of moisture in the atmosphere, I do not see how it can be a phenomenon of general occurrence in Affghanistan, in which, except at the season and in the places alluded to, the air is always remarkably dry. The other circumstances known to attend on its deposit, are all favourable throughout the country, particularly the nightly lowering of the temperature, and cloudless skies. I conceive it to be probable, that in the places alluded to, as presenting deposits of dew, these may be the effects of moisture derived from the soil during the day, more especially towards its close. This moisture would be deposited during calm nights, presenting the other required conditions. But throughout the greater part of Affghanistan, the habitual summer dryness is not modified by any such source of moisture.

Description of another new species of Pika, (LAGOMYS) from the Himalaya. By EDWARD BLYTH, Curator of the Asiatic Society.

The genus of the Pikas, (*Lagomys*, Cuvier,) which, until the comparatively recent discovery of a species upon the Rocky Mountains of North America, by Dr. Richardson, was known only by the figures and elaborate descriptions supplied by Pallas of three species, inhabiting the Steppes of Northern Asia, has lately been detected upon the Himalaya range by Dr. Royle, who carried home a single imperfect skin of a decidedly new species from the Choor Mountain, (subsequently to which, however, other and perfect skins have been obtained,) while another new species is now figured and described, (Plate —) by Mr. Hodgson from Nepal, to which I have the pleasure of adding a seventh, recognised by Captain Broome, as of common occurrence in Lahoul, Ladakh, and Kooloo, and which extending westward, may possibly also be the “small species of *Lagomys*,” noticed by Captain Thomas Hutton, as an inhabitant of the hills of Afghanistan.*

The materials for description consist of a skull and perfect skin, (now mounted,) which were presented to the Asiatic Society, by their late Honorary Curator, Dr. Evans. The animal is in all respects a typical *Lagomys*, which precludes the necessity of entering into such details, as are of generic rather than specific application. From Dr. Royle's species, (*L. Roylei*, Ogilby,) and that now described by Mr. Hodgson, by the appellation *Nipalensis*, the present animal is at once distinguished by its inferior size, measuring but 6 inches in length, though the condition of the skull proves the specimen to have been fully grown, and its sex is male; from heel-joint to extremity of middle toe-nail measures $1\frac{1}{4}$ inch, the ears (posteriorly) $\frac{7}{8}$ inch and $\frac{3}{4}$ inch broad; and the moustaches are very long, a few of these vibrissæ exceeding $2\frac{1}{2}$ inches, and passing considerably beyond the tips of the ears. The general cast of colour, approaches that of an English Water Vole (*Hypudæus Aquaticus*), judging from memory of the latter, having a distinct rufous tinge, and the fur, which is delicately soft as in all the genus, consists, as usual, of two kinds, differing only in the longer having coarser tips of another colour, which latter is alone visible at the surface; these

* Vide Calcutta Journal of Natural History, vol. i. p. 558.



longer hairs are $\frac{3}{4}$ inch in length, and for rather more than $\frac{1}{2}$ inch are slaty-black, then pale brown, afterwards more rufous brown, and finally tipped with a dark colour; the under-parts are dull whitish; the feet pale brown, with a faint tinge of rufous above; the anterior moustachial bristles dull white, and the posterior portion of the same tuft blackish; and the ears are nearly naked posteriorly, having only a slight downy tuft near their base, and a scanty border of minute hairs near the margin, while anteriorly (or within) this border is more developed on the outer side, and there are some long hairs growing from the inner corner; the form of the ears is a rounded oval, with a very slight indication of a terminal angle at the extremity of the outer edge, the margin being slightly fringed with whitish; the nose is completely hairy; there is a more decided tinge of rufous on the forehead, and on the sides of the neck toward the fore-limbs; and the ear has the usual internal conch, or involucrum, observable in other members of this genus. The skull measures $1\frac{5}{8}$ inch in total length, and $\frac{7}{8}$ inch across at the *zygomæ* near the hind edge of the orbits; from front of bony palate to inferior margin of occipital foramen not quite $\frac{7}{8}$ inch; and the vertical height, with lower jaw *in situ*, $\frac{7}{8}$ inch. I cannot do better than apply to this species the name of *Lagomys Hodgsonii*. It is obviously distinct from all the others

It may be remarked, that a fossil species of *Lagomys*, from the Osseous Breccia of the Island of Corsica, is noticed by Baron Cuvier, who describes and figures the skull in his "Ossemens Fossiles," tom. vi., page 598, (6th edition, and plate 175,) figs. 4, 5, and 6.

Literal Translation of the Dhavala Inscription. By Pundit

SURODAHA PRASADH.

1. May the (rays of the sun) which remove darkness, protect you.
2. The four-headed (or *Brahma* was) enamoured of *Sabitre*, the wife of *Surya*, (Sun,) from whom was born *Harivarna*, who was the ruler of the whole world. He was, as it were, the rising sun amidst the new clouds to the lily-like eyes of all, and who further deprived the females of his enemies of the beauty of their moon-like faces, (*i. e.* by causing the death of their husbands.)
3. And who has grown wise by his (constant) exercise and compassion. *Viswavarna*, was in morals like the sea rising high by the influence of the moon-beams, and glorious as having possessed the loft and ancient Jaina temple, which deprived the peaks of Himalaya of their splendour. By him (was ***) by means of gifts ——— was well as to the Gods ———
4. ——— From him was born *Aroma*. ——— From him sprung *Dhavala*, like the moon-beams from the moon, enlightening the whole world. He, while on his elephant, (in battle,) cut off his enemy's army, and thus noted his revenge.
5. A multitude of Rajas of the wild countries ——— *Soobha Raja* was born. He continually and wonderfully enjoyed (?) by the might of his arms. ——— He restored the army of (?) (to battle) who were defeated by those of *Anuchandra*. He (*Dhavala*) established two (images) of Gods.
6. ——— (He who was) superior to all, established tranquillity among his people. ——— The Raja *Dhoronivaraha*, who was himself very wise and great, threw head-long (expelled) the Raja *Kondesika* from his dominions in the jungles, as an elephant throws a tree, and a boar a young *koal*, (a kind of boar.)
7. As* one takes his rest under a tree when fatigued with the burning sun, so the multitude have taken their refuge under him (or under the cool shade of his arms.) He was beautifully mild as the moon. Sung (the fame) of (him,) who was as the crest jewel of all the archers, and always devoted to his spotless (true) faith. He was the follower of ———

* One whole sloka, measuring 13 letters in each stanza.

8. At his (Raja's?) expedition towards his enemy's dominions, the Sun obscured with dust (rising high) from the earth, while passed over by his army, was as it were, obliterated in disgrace, from the firmament, being totally overpowered by the spirit (of this Raja.)

9. ——— (He was?) like the sun तेजोभिः in spirit; *Boudha* in compassion; *Yudhisthira* in wisdom, truth, and virtue; *Pralayanila** in might; the minister of *Indra*; (*Vrihaspati*) in counsels; and (*Cupid*)† in beauty, which is attractive of female minds.

10. ——— (He) who was fortunate and virtuous, safely performed the ceremony agreeably to the doctrines (of *Veda*), which had ever been performed by the Gods themselves and———for *Kali*, never creates any interruption in such affairs, when undertaken by a man of virtue (as this.) (Besides) men having even in *Kaliyuga* perceived the spotless ——— this Raja.

11. The Creator having as if considered it (?) proper to be placed together with talent, *palace* ——— beautiful as the moon-beams. Who else could describe it in its full length? The kingdom of this Raja was *Hastikanehika*, which like the region of *Kuvera*, was inhabited by people of great fortune, and white like the ice (pearl) necklace, and like *Siva*.

12. ——— Equal‡ to the minds of those, who reside (together) at one and the same place ——— joy and health around ——— beautiful as washed gold, where (in the kingdom) not like the beautiful shafts of *Rama* ——— by others always amidst a crowd of both sexes ——— moderation, restriction (of passions) compassion, and pleasant converse.

13. (Slokas of double meanings, altogether untranslatable into English.)

14. His court Pundit, who was like the priest of the Gods (*Vrihaspati*) endowed with gravity and such other *natural* qualities———

15. The splendour of a tank, (beautiful with the plants of full blown lotus) ———

16. ——— The whole heavenly region was struck with wonder, admitting it to be as if the second *Lokaloka* mountain.

* Wind at the time of Deluge.

† This comes out from sense.

‡ It is translated literally, but what the sense should be, is out of my ability to make out.

17. Having by his (?) instigation considered his wealth, wife, and sons, (family) unstable as the breeze of the fan.

18. (This temple) was illuminated (with the lustre) of the starry ornaments of female images, and exhibiting how far the power of architecture extend ——— having four corners shining with jewels, reddish like shells and pearls.

19. In this ocean of the world, established by those who are renowned. Formerly the *Vidagdha** *Raja* यदुत्ता was like the descendants of *Yodu* (*Vansa*) * * *.

20. ——— The powerful *Dhavala Raja* (having fought) in battle with Jainas ——— so long as the earth supported on the hood of *Ananta* will continue to wear the splendour of *Pattala*,† which resembles a temple supported by a silver pillar (so long shall this * * *.)

21. ——— The poet has written these slokas in best metaphors, &c. The priests who were superior in talents, moderation, and धुर्य capacity, for holding burdens, performed many sacred rites.

22. ——— (He *Dhavala*) has with a view of discharging his debt to his ancestors, consecrated (dedicated) this (temple?) at Mahidhwaja (a village) in the Samvat year 1053, on the 27th Magh, while the Moon was in *Pushya*, (a planet.)

(Five lines obliterated.)

28. (This line is entirely obliterated, except the following words, “not formerly possessed by *Bidagdha*.”)

29. (Ditto, except the words “even by the people of the town.”)

30. ——— The earth has been enjoyed by many kings as the Sagara and others, and he who rules it in his turn, is the sole enjoyer of its fruits.

* The word *Vidagdha*, which means “learned,” may also be applied as a name.
—S. P.

† A watery region below the earth.

Observations on a second Inscription taken in fac-simile from the neighbourhood of Mount Aboo. By Capt. BURT, Bengal Establishment, F. R. S.

In a notice of the Bussuntghur Inscription, (Asiatic Society's Journal, No. 116,) I made mention of another also sent to me from the same part of the country by Capt. Burt, which I hoped might, when decyphered, throw light on the dynasty of Rajpoot chieftains, whose names were therein first made known to us. Some trouble has been required to read this second inscription, which is to a great extent not to be made out, owing to obliteration of the characters. It is cut, Capt. Burt tells me, "in the interior of a gateway leading to Mandir, distant one kos from Beejapoor, on the route from Odeypore to Sirohee near Mount Aboo."

The date of this inscription is Samvat 1053, equivalent to A. D. 996, and it is consequently 46 years anterior to that taken from the Baolee, at Bussuntgurh. It contains, also, as will be seen, notices of a new dynasty, and mentions a principality hitherto unknown. *Raja Dhavala*, of the race of *Viswavarna*, is represented as engaged in constant wars with neighbouring chiefs, and appears, on the consolidation of his power, to have followed the usual course of erecting, and dedicating a temple with pious reference to his ancestors. Lands and endowments were doubtless assigned in the ordinary mode for the maintenance of this shrine, the record of which has been obliterated with the erasure of great part of the inscription.

The facts which may be deduced from this ancient record, confirm the theory which I ventured, with Lieut. Cunningham's concurrence, to put forth, based on the Bussuntghur inscription, as respects the condition of Meywar subsequently to the first invasion of the country from Cabul, in A. D. 812. The presence in that inscription of the names of a new dynasty reigning over the country still called locally *Badari*, near Mount Aboo, about A. D. 1042, and the historical knowledge which we have of a so-called division by *Bhritripad*, about two hundred years previously of the territory under his domination among thirteen sons, led to the conclusion, that this list of names recorded the reign of a line of petty potentates, either descendants of *Britripad's* successors, or, as is more likely, of chieftains established in a small

principality by force of arms, after the temporary disruption of the monarchy at Chitore by the Mussulman invaders. The justice of this opinion is confirmed by the tenor of the *Dhavalā* inscription now before us. Enough of it remains to give us evidence of the existence contemporaneously within the boundary of the ancient monarchies of Chitore and Odeypore of another petty state, whose princes we now, only have for the first time heard of in this obscure record of their acts, and whose territory may be perhaps yet, faintly remembered by some local appellation, or traditional record. The inference is natural, that similar mementos of other petty states established by the sword about the same period, during the time of political confusion may be still extant in Meywar. Their discovery would of course afford further proof of the truth of our suppositions as to the state of great part of Rajpootana, for two hundred years or more after the first Mussulman invasion.

Enquiry into such monuments of antiquity, however slow, and however desultory, has yet the advantage of adding something to the amount of our knowledge of the true history of India. Materials are gradually accumulating, whence in the course of time, a sound and rational account may be framed of men and things as they at various times have been in this vast country. From the inscription before us, meagre and mutilated as it is, we are able to find evidence of hostilities carried on at this period against the Jains, on the ground of religion, and noted in this record as an act of special merit. We are empowered to conclude, that in Rajpootana, war and foreign invasion had not as in other parts of India, (as evidenced by other inscriptions,) caused the pursuits of literature to be neglected, the style and language of the record being singularly good: the arts, as it appears by the description of the temple, continued also to flourish, and the power of the ruling prince was sufficiently well established to enable him to declare the doctrine of possession in right of sovereignty of the produce of the earth: "He who rules it in his turn, is the sole enjoyer of its fruits." The amount of information thus acquired is often but small, and the labour of attaining is heavy; but of such, let it be remembered, is the material of real history composed, and by such evidence alone are the errors and misrepresentations of tradition exposed and corrected.

A letter to the Secretary to the Asiatic Society, on the Nurma Cotton of Bundelcund, from J. G. BRUCE, ESQ.

In compliance with a letter from the Secretary to the Government, North-Western Provinces, regarding the Nurma cotton produced in Malwa, and requesting I would furnish you direct with any information which I might possess on the subject, I have the pleasure to inform you, that the Nurma cotton, of which the fine Chundellee cloths are manufactured, is the produce of a shrubby perennial, cultivated in the vicinity of Chunderee, to the extent required for the fabrics of that place. I never heard of any being grown for exportation in its raw state.

The piece goods manufactured at Chunderee, I beg leave to inform you, consist principally of costly cambrics, turbands, and *seylahs*, or waist bands: these were of so beautifully fine a texture, that some of the higher numbers sold for two hundred rupees a piece, and were used by the Native princes and noblemen.

Although the Chundellees are so much dearer than the Europe cambrics, the Native princes give the former the preference. It is said to be more durable, and keeps the body cooler in the hot season, from the quality it is said to possess, of more readily imbibing respiration. Had it not been for this preference, the manufacture of the Chundellees would long since have been discontinued.

When I came to Calpee in 1808, I found some few plants of the Nurma cotton in the "Nuzzer Baug" garden, belonging to the Jallone Rajah. They had been sown before the seat of his government had been removed from Calpee in 1804 or 1805, to supply him, and his household, with the Brahminical* thread worn by the Brahmins (the Rajah himself was one) and higher castes of Marhattas. The cotton which these plants bore was beautifully soft, and of a good staple. I cannot, at this distance of time, distinctly recollect whether it was the smooth black, or downy grey seeded; but, as far as my memory

* The Nurma cotton was, no doubt, chosen for its length, strength, and fineness of fibre. Moor, in his Hindu Pantheon, page 379, says, "The Zennar is composed of three threads, each measuring ninety-six hands (cubits); they are twisted together, and folded into three; then twisted again, making it to consist of nine threads: these are again folded into three, without twisting, and each end fastened with a knot. Of these Zennars, a Brahmin wears four; the other privileged tribes three."

serves me, I think it was the latter. It appears to have been cultivated about Chunderee, rather extensively, some years back, to meet the demand there was then for the Chundellees at all the Native Courts.

It was customary with the Native princes, when they met together to celebrate marriages, or on other occasions of rejoicing, to present to each other, as well as their dependents, the Chundellee Mamoodies, (cambrics,) turbands, and seylahs, among other things, as Khillats. In fact, these were in requisition at the Courts of all the Native princes in Bundelcund, Malwa, and Central India generally; but since machinery has tended to lower so considerably the prices of Europe cambrics, the Chundellees are merely required for the personal garments of the princes.

Chunderee is a province of the Gwalior state, situated on the banks of the Betwa river, between Jhansee and Chutterpore. I imagine the Resident of Gwalior, instead of Indore, could more readily afford the particulars required respecting the Nurma cotton. In the letter from the Secretary to the Government of Bengal, it is denominated the Nurma cotton of Malwa. Without a more definite description, the Resident may suppose that the information called for, relates to the indigenous Malwa cotton, or *Gossypium Herbaceum*, which is the same as the common Bandah. It would prevent mistake, if the Nurma grown about Chunderee, from which the Chundellees are manufactured, was mentioned.

As Chunderee borders close upon Bundelcund, I think the Nurma cotton, which has already been acclimated to the country, and used for ages in the manufacture of the finest fabrics, may be grown successfully in the whole of Central India and Bundelcund, if not generally in the North-Western Provinces. The soils of the two first are similar; principally the rich black marl: that of the latter mostly clay and sand. The black marl seems to be decidedly the best for cotton.

There is another description of cotton, which is of a longer staple, and finer fibre, than the common country. It is grown about Omrawuttee, and known in the Mirzapore and Moorshedabad marts as the cotton of that place. It has, however, the disadvantage of being very greatly intermixed with leaves and dirt, from being allowed to fall on the ground, before it is collected. In consequence of its being found so foul, there was never any demand for it in Calcutta, but it was

dispatched overland from Moorshedabad, principally to Dacca and the adjacent districts, for the manufacture of the muslins. Notwithstanding it was so foul, it realized a better price, when I was concerned in the cotton trade, than the Banda produce.

Omrawuttee is a large trading mart, situated on the Poorna river, in the Nizam's country, bordering on Nagpore. Owing to the immense distance Omrawuttee was by land from Calpee, this cotton never formed part of the Company's investment. I was given to understand it was black-seeded, and originally of foreign importation.

I have tried, at various times, the Sea-Island and Upland American, the Egyptian, the Bourbon, and the Pernambuco cottons several years, on my own account, to the extent of fifteen and twenty beegahs at a time; and lastly, on a scale of four hundred beegahs, in partnership with two of the Calcutta mercantile houses in 1837, in the neighbourhood of Calpee, with, and without irrigation; but never at a remunerating price. My last experiment of four hundred beegahs happened to be made when the famine raged with so much severity in the North-Western Provinces; and I attributed the drying up of the plants, notwithstanding they had the benefit of being irrigated during the prevalence of the hot winds, to the unfavourableness of the season. The seed was put into the ground in March and April, and watered from wells, until the periodical rains commenced; but as soon as there was a cessation of rain, the plants began to wither, and although watered afterwards, became brown, and the leaves had the appearance of being scorched, and ultimately fell off, leaving a few capsules on the leafless plants, the produce of which, unfortunately, did not cover a tithe of our outlay.

I ascribed, as I have already stated, our want of success, solely to the untowardness of the times; but from what I have observed in the present season, with respect to the experiment now carrying on under the superintendence of Captain Bayles, and the American planters, I am inclined to believe that my failure was not entirely owing to drought: for the plantations at the four localities in Bundelcund and the Dooab, bear the same appearance, as mine of 1837 did, and the result is likely to be as unfavourable.

The American planters at the Farms commenced their cultivation of the cotton with the first showers of rain that fell at the end of June, and

beginning of July last. As long as the rainy season continued, the plants looked healthy and fresh. About the middle of September, the rains, it may be said, ceased; and almost immediately after, the leaves of the plants became brownish, and began to wither and fall off. This could not have arisen from want of moisture, as some of Captain Bayles' cotton fields had only, a few days before, been well saturated with the rain that had fallen.

Towards the end of September, the wind set in rather hot from the Westward, and I am of opinion, that the injury which the cotton sustained, is ascribable to it. If my conjecture be correct, I fear the American method of culture will never answer in Upper India, owing to the hot winds.

The American mode of cotton culture, I think, is, in one essential point, objectionable with respect to this country. It exposes too much of the surface of the soil to the rays of the sun; this is liable to occasion too rapid an evaporation of moisture. It has been found by experience, the "Purwa" soil, or mixture of clay and sand, will not bear it; and the black marl, I have had opportunities of ascertaining, unless it has lain fallow for some time, and is overrun with weeds, is seldom more than superficially turned up. The "*buckhur*," instead of the plough, is usually employed in the preparation of the black soil. It has an iron scythe, in the room of a share, about twenty inches broad, and five deep, fixed to a beam of wood, between four and five feet long, and six inches in diameter. The *buckhur* is peculiar to Bundelkhund, Malwa, and Central India generally. In the course of the day, as far as five or six beegahs of land are *buckhered*. The iron scythe, which is fixed to the centre of the beam, enters about eight inches in the ground, effectually cutting, and rooting up weeds and grass, and the beam pulverizes the earth as it is turned up. The sand intended for the Khurreef, or rainy season crop, is once *buckhered* before the seed is scattered. It is then ploughed to cover the seed, and prevent the birds from getting at it. The Rubbee land is two or three times *buckhered* during the rains, and merely sown with the drill plough about eight inches deep.

The cultivators of this district have an idea, that if too much of the soil is turned up, the produce is not so great. The black soil is subject to immense cracks and fissures during the dry months of the year,

which again fill with water and close up, after the rains have set in heavily. The cotton produced in this soil has ever been reckoned superior to that which is grown in the others. It is to be regretted that the Mexican seed, which Captain Bayles brought with him to this country from America, was not tried, in the first instance, on this soil, as the rains were uncommonly mild, and in a moderate season, the cotton in this soil grows best; it would have been the means most probably, of securing an abundant supply of seed acclimated to the country, to have commenced the following year, on a scale commensurate to the magnitude of the object the Court of Directors had in view; which, I am led to believe, from having had a perusal of their despatch on this subject, is the supercession of the supply from America, for the manufactures of Great Britain.

If Great Britain is ever to look for the supply of its manufactories to India, other measures, than those which have been commenced upon, must be resorted to. Ages must pass away, (if the present method of home cultivation ever succeeds, which however is problematical,) before India can respond to the demands of England.

The most feasible and simple plan, it appears to me, would be to follow the one which Captain Bayles partially adopted this season, at my suggestion, when I was ordered by Government to aid him, in fixing his localities. I procured him engagements from the landholders and ryuts, contracting for their labour at four rupees per beegah. They were to plough,* sow, weed, scarify, and do all the work that was required, entirely under the superintendence of the American planters. If the land-rent, establishment, and other expenses, trebled the amount, still the cost of the cotton would have been very moderate. The indigenous plant, when properly attended to, will yield at least an average produce of a maund of clean cotton; the Mexican, cultivated according to the American system, ought to give the same, if not more. Any mercantile man would pronounce a maund of American cotton landed at Calcutta, at twelve rupees, very cheap, and willingly engage for all that could be produced at such a rate through Captain Bayles' agency.

It is greatly to be lamented that the result of Captain Bayles' experiment proved so unfavorable in the present season. Had it been

* With their own cattle.

successful, those who had contracted for their labour at four rupees a beegah, might have been encouraged to have grown the cotton on their own account and risk. Until the landed proprietors and ryuts can be persuaded to do so, there is little likelihood of India ever being able to furnish the quantity, which America now annually sends to Great Britain.

I prevailed upon Captain Bayles to receive the engagements at four rupees a beegah, with the view of shewing the Government, and the mercantile community, at what specific cost the American cotton might be produced in Bundelkhund. Unless this was done, it appeared to me, individuals would hold back, from the impossibility of telling what the actual cost of a beegah, or maund of cotton, would amount to, under the "neez," or home cultivation system. The purchase and feeding of cattle, the cost of ploughs, the pay of the ploughmen and establishment, and innumerable other expensive items, were not likely to elicit readily this desirable information.

As long as Captain Bayles and the American planters cannot make the produce of their mode of culture yield a remunerating value in the market, it is unreasonable to expect, that capitalists will embark in the speculation, or the impoverished landholders and ryuts will relinquish their system, which, they consider, secures to them at least a subsistence, if not plenty.

It is worthy of remark that the American cotton, cultivated by the ryuts with their own small-sized cattle and country ploughs, at four rupees the beegah, under the direction of the American planters, was in every respect equal to what was cultivated on account of Government, with the large-sized cattle, and American imported ploughs, under the superintendence of the planters themselves. This proves that neither a costly plough, nor team of horses, are absolutely necessary. The loss which Government must inevitably incur upon the present year's experiment, is, in some measure, repaid by the acquirement of this valuable knowledge. For how, or where, could the poor ryuts have supplied themselves with such expensive agricultural appendages, if the successful introduction of this superior description of cotton, depended entirely upon the possession of them.

It having been ascertained that the means already in possession of the ryuts, will answer for the cultivation of the American cotton, the

next point to be considered is, the most expeditious way of accomplishing this highly important national object. As the cultivators, I am of opinion, will not engage on any other terms, before they have practical proof that a beegah of the American will yield as much profit to them, as their indigenous cotton: the most eligible plan appears to be, to employ the landholders and ryuts to cultivate, as they did in the present year, by contracting at so much a beegah. If the Cotton Association, which has been established in England, will consent to undertake the risk, and come forward with the means, I am inclined to believe, that, in two or three years, a cultivation to almost any extent may be secured for the Association, through the agency of Captain Bayles, and other fit persons.

Humeerpore, 18th October, 1841.

Letter to the Editor, on Lichens in the Himalayas, from HENRY COPE, Esq.

I regret much to say, that in consequence of my having been obliged to leave Mussooree for this place some days since, the rich harvest I had promised myself, on the investigation of the Lichens, suggested by you, has been interrupted, and I have been enabled to do much less than I had promised myself; especially as regards the investigation of the Botanical characters of the plants in question,—an almost untrodden path, and therefore the more deserving of exploration, especially with the possible results likely to accrue to the arts before me.

I have now the honour to inform you, that I dispatched, previous to my leaving Mussooree, small parcels of seven kinds of tree Lichens; which, if found useful, are likely, from the respective quantity of each, to become objects of commerce. They are two species of *BORRERA* or *EVERNIA*, one of them that is commonly in use amongst the natives as a dye, and named by Dr. Royle, *B. Ashneh*, one species of *USNEA*, one species of *PARNULIA*, three of *RAMALINA*, and a small quantity of a species of *CLADONIA*. I have been very particular in sepa-

rating all other species and extraneous matter; and as I see by Dr. Hooker, that the presence or absence of the fructification is supposed to make a difference in one of the Dye Lichens he notices, I have put in two small parcels (paper), specimens of the B. Ashneh, with and without the fructification, for separate experiments. I have sent you also, for exhibition at the Meeting of the Society, branches of the Barberry (*Rusoot*, *Berberis*) which will, in some manner, illustrate the fact of the abundance of some of the Lichens, as whole trees are as thickly covered as the pieces I send you, and absolutely killed by parasite. There are very few Lichens growing on rocks; they are almost entirely confined to the trees (especially the extreme branches, where no doubt they can imbibe moisture more freely) and shrubs, but freely taking root amongst the moss, &c., on which they may occasionally fall from the trees, detached by wind or the birds. The greater part of those I have sent, are found on almost every kind of tree or shrub; but more particularly such as have the roughest bark. The *Rhododendron* alone seems almost exempt from them, though it has other less conspicuous species lodged on its smooth epidermis.

I had commenced a collection for the Hortus Siccus, but even that was unfinished, or rather only in its infancy when I left: but such as it was, I thought it best to forward it to you, as it may enable competent botanists to pronounce more positively as to the correctness of my nomenclature, which was, however, much improved by the assistance of a small except from his Herbarium sent me by Dr. Falconer. The number of species I have forwarded is 19, and I have no hesitation in saying, that it is scarcely a tithe of those to be found in the Himalayas. The greater part however will only be valuable as botanical curiosities, as they do not individually occur in sufficient quantities, to warrant the probability of their becoming useful in commerce.

I have, in a separate communication, endeavoured to give you my gleanings of all that is known respecting the various properties of the Lichens, and would beg the particular attention of chemists, and of your Curator especially, to the recommendation of Westring respecting the extraction of the dyeing principle from the Lichen, on the spot where it is found, as the chief cost of any article sent from the Himalayas over the capital to England, would consist of freight, &c.,—

a point of great importance in so bulky a substance. Should you require larger quantities of the Lichens, I can furnish them. As the mode of dyeing adopted by the natives, may not be generally known, I do myself the pleasure of handing you the same, with a few other details, which may be of interest.

Chulchelera is the name by which the *EVERNIA ASHNEH* is known in the Upper Provinces of Hindoostan, but not to the natives of the mountains, who have one general name for all plants growing on the bark of trees, viz. *Chal*, a word meaning the bark itself, with all that is on it.

As far as my information goes, the chief supply of the Doab is derived from the village of Nagul, no great distance (about ten miles) from Dhera, and the town of Khalsee, on the right bank of the Jumna. In these places the dealers in Lichen of Saharanpoor, (bunyas,) have correspondents, to whom they write at the commencement of each season, and mention the quantity if most probably required for consumption. These correspondents, also bunyas, notify their wishes to the petty chiefs or zumeendars in the hills, and the quantity ordered is delivered, the Paharees receiving either cash, but mostly salt, in payment. Each Paharee brings down a load of about 30 seers, packed in leaves, and bound with Moonjh, and has to pay the Gurwal Rajah, at established chowkees, a small duty, varying according to local arrangements with the chokeydars. The time for gathering the Lichen is January and February. The Nagul and Khalsee bunyas keep no stock on hand, but send all they receive to Saharanpoor. I am told the quantity annually exported to this town barely exceeds 100 maunds, (less than four tons,) of which about ten are used in the place and its vicinity, and the remainder sent further south. When first gathered, the Paharees are not particular in confining themselves to the genuine species required, but to hasten their work, tear off several other kinds, and along with them, break off the branches on which they grow. This, and those, give much trouble to the consumer, for the exporter below does not take the trouble of cleansing the article he receives, before he sends it forward. As the Lichen is only used during the earlier months of the hot season in the plains, any remaining unconsumed after these, is spoilt by keeping in bulk during the rains, and thrown away as worthless. The entrepots for the Lichen to the east

are Kassipoor and Philibeet in Rohilkhund, which derive their supplies from the Kumaon province.

The Lichen rarely finds its way into the hands of the regular dyers, as almost every Mussulman, and many Hindoos, know how to, and do use it as a household article of manufacture, thus saving the cost of the dyer's labour. One seer will dye from ten to fifteen pieces of cloth, of the ordinary length, made in this part of the country and about two feet broad. The article when brought in the bazar, is carefully picked, and freed from all extraneous matter, thoroughly dried in the sun, and rubbed with the hand on the rope bottom of a Charpae, till not only all the remaining particles of earth, bark, &c., are rubbed through, but until the whole assumes a white colour, by the peeling off of the dark under-surface, which you will observe on the plant. This process gives to the massive an almost silky softness. The Lichen is then put into as much water as may, in the estimation of the operator, be required to dye the cloth in hand, and boiled until the colouring matter is strongly given out. The dye water is then cooled, and modified by the addition of various substances, according to the taste or fancy of the amateur dyer.

These are chiefly Kutt, (Catechu, which is plentifully produced in the Sewalik Hills by the natives, from the wood of the *ACACIA Catechu*,) a pice weight of which, to the whole quantity, deepens the colour much; but is not generally admired. The Kutt is pounded, rubbed on the *seel* with water to a paste, mixed with more water, strained, and added to the Lichen dye. This is the way in which the following ingredients are also added.

2ndly. Mehendee leaves (*LAWSONIA inermis*) much used and admired.

3rdly. Pawn leaves (*PIPER Betle*).

4thly. Flowers of the Harsinghar (*NYCTANTHUS arbor tristis*,) which is indigenous to the Dhoon (valley) of Dhera, and its neighbourhood, &c. &c.

In order to give the cloth an agreeable odour, it is usual to add, when about to be dipped for the last time into the dye, a small quantity of the following aromatics, pounded, ground, strained, and in the same manner as the Kutt, &c.; viz., Nagurmothor, (root of the *CYPERUS rotundifolius*,) Kaphoor Kucheree, (root of the *HEDYCHIUM spicatum*,) and Balchur, (root of *VALERIANA Nardus*).

The cloth is dipped once, twice, thrice, or even oftener, according to the intensity of the colour it is wished to impart, carefully wrung each time, and hand-dried in the shade. The cloths chiefly dyed are those used for pugerees or doputtas. Instead of washing, (which however they will bear without loss of colour,) the cloths are, when soiled, occasionally dipped in whatever portion of the dye may have been left, and put aside for this purpose.

The Saharanpoor bazar rate of the Chulchelera will give a very fair idea of the cost and charges of not only the Chulchelera, but of all the other kinds, should they become articles of commerce, and be sought after for exportation.

The Chulchelera, in its rude state, (that is as gathered with admixtures in the Hills,) is sold in Saharanpoor, when cheap, at rupees 1-8 per maund, or 7 pies the seer, (3s. per maund, or 4l. 4s. per ton); and when at the highest price, at from 2-8 to 3 Rs. per maund, which would give from 6l. 6s. to 8l. 8s. per ton. I have no doubt that, in case of an increased demand, the article would also rise in price, and that it would never be procurable at less than 6l. 6s. per ton; that is, rupees 2-8 per maund. At Saharanpoor, it would require (or rather at Nagul or Khalsee) to be picked and properly packed,—an operation which, from its cost, say 4 ans. per cwt. and the reduction in weight it would cause (at least one-third,) would enhance the price from 2-8 to rupees 3-10-8, and including the cost of one gunny bag per maund, at least 5 ans. more, or say in round numbers rupees 4, or 8 Rs. per maund, or 11l. 4s. per ton.

To this, carriage from Saharanpoor to Ghurmuktiser, or rather Sookerthal, a ghat twenty miles above Ghurmuktiser, at the minimum rate of 8 ans. per maund, and freight to Calcutta at no less than 1-4, including insurance, &c.; and we shall find the cost of the article delivered in Calcutta to be 5 rupees 12 ans. per maund, or 16l. 2s. per ton. The freight and expenses to London will not fall much short of 5l. thus allowing the Lichen to be delivered in London at 21l. odd.

The following is a rough guess of the proportions in which the other species I have sent might be obtained, from which it would appear that there would not be much difference in the cost of the several kinds.

Taking the Chulchelera as the criterion represented by the figure 1, I think the other species might be thus placed:—

Everniæ species (? tenacissima)	...	..		$\frac{1}{4}$
Parmeliæ ditto	...	...	..	$\frac{1}{2}$
Usnea florida	...	...	...	$\frac{2}{3}$
Ramalinæ species (tree)	...	...	...	$\frac{1}{3}$ $\frac{1}{2}$ $\frac{1}{2}$

The species of Cladonia at not more than $\frac{1}{8}$, if so much.

This proportion of Course would only influence the original cost of gathering.

Dehlee, 4th October, 1841.

Proceedings of the Asiatic Society.

(Wednesday Evening, 6th October, 1841.)

Dr. J. J. HEBERLIN, Senior Member present, in the Chair.

The following gentlemen proposed at the last Meeting were ballotted for and duly elected as Members; viz:—

Honble. A. AMOS, Esq.

R. BARLOW, Esq.

C. G. MANSEL, Esq.

Ordered—That the usual communication of their election be made to the aforesaid gentlemen, and that they be furnished with the rules of the Society for their guidance.

Library and Museum.

Books received for the Library of the Asiatic Society at the Meeting of 6th October, 1841.

Royle on the Productive Resources of India, London, 1840, two copies, royal 8vo. 2 vols.

Report of the British Association for the advancement of Science for 1840, 8vo. 1 vol.

Proceedings of the Zoological Society of London, 1839, part 4th, 1 vol.

Hodgson's Illustrations of the Literature and Religion of the Buddhists, Serampore, 1841, ten copies, 10 vols.

The Oriental Christian Spectator, August 1841, vol. 2d, No. 8, second series, Bombay, pamph.

Transactions of the Zoological Society of London, 1840, vol. 2d, part 4th, 4to. 1 vol.

Transactions of the Royal Society of Edinburgh, 1840, vol. 14th, part 2d, 4to. 1 vol.

The Annals and Magazine of Natural History, including Zoology, Botany, and Geology, June 1841, vol. 7, No. 44, pamph.

Philosophical Magazine and Journal of Science, 3d series, vol. 18, No. 117 and 118, April and May, 1841, pamph.

Calcutta Christian Observer, October 1841, new series, vol. 2d, No. 22.

Yarrell's History of British Birds, London, 1841, part 25, pamph.

- Journal of the Bombay Branch Royal Asiatic Society, July 1841, No. 1, pamph.
 Calcutta Monthly Journal, &c. August 1841, third series, No. 81, ditto
 Proceedings of the Royal Society of Edinburgh, 1840-1841, No. 18, ditto.
 Reports of the Council and Auditors of the Zoological Society of London, April, 1840 and April 1841, ditto.
 Seear-Ool-Mutakh-Reen, (Persian,) 1. vol.
 Another Persian Book, "Heedayah," vol. 3d.
Books presented to the Library of the Asiatic Society by Mr. A. CSOMA.
 Histoire général des Huns, Paris 1756, tome 1ere. parties 1ere. et 2d, et tome 2d. 4to. 3 vols.
 Dufresne Choix de Littérature, Edinburgh, 1808, 8vo. 1 vol.
 Recueil ou Melange Littérature, &c. par A. Scott, Glasgow, 1803, 8vo. 1 vol.
 Deodati Lettre d'una Peruviana, Londra, 1798, 8vo. 1 vol.
 Journal of the Royal Asiatic Society of Great Britain and Ireland, London, 1834-35-36, Nos. 2, 3, and 5, 3 vols.
 Memoir of the Expedition of an Ecclesiastical Establishment, by the Rev. C. Buchanan, London, 1805, 4to. 1 vol.
 Transactions of the Royal Asiatic Society of Great Britain and Ireland, London, 1833-34, vol. 3d, parts 1st, 2d, and 3d, 4to. 3 vols.
 Ditto ditto, Appendix, 1 vol.
 The Religion of Reason and of the Heart, by Chas. Benhurini, 1 vol.
 Europe and America, or the Future Prospects of the Civilized World, by De S. Phiselduk.
 Râdjataranginî, ou Histoire des Rois du Kachmîr, traduite par M. A. Taylor, Paris, 1840, in 2 vols. 8vo. thirteen copies, 26 vols.
 Comptes Rendus Hebdomedaires des Séances de L'Académie des Sciences, tomes 6e. à 10, 4to. 5 vols.
 Histoire des Mongols de la Perse, traduite en Français par M. Quatremère, Paris, 1836, tome 1ere. royal folio, (2 copies,) 2 vols.
 Journal Asiatique, 3rd série, Paris, 1840, tomes 9 and 10, 8vo. 2 vols.
 Recherches sur L'Ancienne Astronomie Chinoise, 4to. 1 vol.
 Brosset's Chronique Géorgienne, Paris, 1831, six copies, 8vo. 6 vols.
 Nouvelle Suites a Buffon, Cours de Geologie, tome 2, et Planches, 2d Livraison, Paris, 1839, 8vo. 1 vol.

 Histoire des Végétaux Phanérogames, tomes 7 and 8, Paris, 1839, 8vo. et Planches, 11 à 14 Liv. 2 vols.
 Dr. Walker's Histoire des Reptiles, tome 5, Paris, 1839, 8vo. 1 vol.
 Ditto ditto, Planches, 5 Liv. 1 vol.

 Histoire des Insectes Orthoptères, Paris, 1839, 8vo. 1 vol.
 Ditto ditto, Planches, 1 vol.
 Geographie D'Aboulféda, Texte Arabe, Paris, 1840, 4to. 2d Livraison, (6 copies,) 6 vols.
 Y.—King, Antiquissimus Sinarum, &c. 8vo. 2 vols.
 Dupin's Bien-Etre et Concorde des classes du Peuple Francais, Paris, 1840, 12e. (two copies,) 2 vols.
 Bulletin de la Société pour l'instruction Elementaire, Juin-Sept. 1840, Paris, 1 vol.

- Société pour l'instruction Elementaire 24me Assemblée Générale, Paris, 2 vols.
Assemblée Générale et Annuelle de la Société de la Morale Chrétienne, Paris, Mai 1840, (2 copies.)
Procès-verbal de la Séance Générale de la Société Asiatique, du Juin 1840, (six copies.)
Coup D'Oeil sur la situation de l'instruction primaire en France, par M. Boulay de la Meurthe, Paris, 1840.
Ville de Paris, Rapports et conclusions de la Commission des livres et Methodes, Année seculaire, 1840-41, 4 pamph.
Rapport sur la 3rd édition du Manuel des Ecoles Elementaires, &c. par M. Sarazin, Paris, 1840, (2 copies,) ditto.
Journal de Médecine et de Chirurgie Pratiques, 9th Année, Paris, tome 9, 1 Cahier, Janvier 1838, ditto.
Echo de la Litterature et des Beaux Arts, Novembre 1840, Paris, ditto.
Epistemonomie ou Tables generales d'indications des Connaissances Humaines, Bruxelles, 1840, ditto.
Extrait des Annales de la Societe Sericicole, 1840, Paris, 2 copies, ditto.
Catalogue de la Librairie D'Ab. Cherbulliez et Cie, a Paris et a Geneve, ditto.
Calcutta Christian Observer, new series, vol. 2d, No. 23, November 1841, ditto.
List of the Geological Society of London, 1841, ditto.
Journal des Savans, Janvier, Fevrier, et Mars, 1841, 3 vols.
Jaubert's Geographie D'Edrisi, tome 2d, Paris, 1840, 4to. 1 vol.
Transactions of the American Philosophical Society, new series, vol. 7th, parts 1, 2, and 3, Philadelphia, 1841, 4to. 3 vols.
Freytag Hamasæ Carmina, textus Arabici, Bonne, 1826, 4to. 1 vol.
Reid on the Law of Storms, with Charts, London, 1838, royal 8vo. 1 vol.
Edinburgh New Philosophical Journal, by Professor Jameson, January to April 1841, No. 60, 1 vol.
Farmer's Cabinet, devoted to Agriculture, Horticulture, and Rural Economy, 4th August 1839 to July 1840, Philadelphia, 8vo. 1 vol.
Calcutta Monthly Journal, for September, 1841, 3d series, No. 82, 1 vol.
Oriental Christian Spectator, September and October 1841, vol. 2d, Nos. 9 and 10, 2d series, 2 vols.
Proceedings of the American Philosophical Society, vol. 1st, Nov. and Dec. 1840, No. 14, and vol. 2d, Jany. Feb. March 1841, Nos. 15, 16, 17, (2 copies each,) pam.
London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, 1841, vol. 18th, No. 119, and Supplementary Number 120, and vol. 19th, No. 121, 3 vols.
Proverbia Arabica, edidit G. G. Freytag, Bonne ad Rhenum, 1838, 2 vols.
Proceedings of the Geological Society of London, 1840-41, vol. 3d, part 2d, Nos. 72 to 75.
Forbes on the Ancient Languages of Gaul, Britain, and Ireland.
Freytag Darstellung der Arabischen verskunst mit sechs Anhaengen, Bonne 1830, 1 vol.
Histoire Naturelle de Poissons D'eau douce de l'Europe Centrale, par Lieut. Agassiz, Planches, 1 vol.

Elliott's Carnatic Inscriptions, MSS. 2 vols.

Freytag's Chrestomathiæ Arabica Grammatica Historia, Bonne, 1834, vol. 2d, and 1st, chapters 7 to 14, vols.

Freytag's Liber Arabicus seu Fructus Imperatorum et Jocatio ingeniosorum, Bonne, 1832, 4to. 1 vol.

Dastoor-Ool-Aunwar, (Persian,) 1 vol.

Kittab Mat-Laol-Audda-en, 1 vol.

Read letter from JAS. CRICHTON, Esq. Colonial Surgeon, with a box of Insects from Western Australia.

Read letter from H. B. HINTON, Esq. Civil Surgeon, Akyab, with six Geological Specimens for the Economic Department of the Asiatic Society.

(To these, reference has been made in the Curator's Report.)

Read Memorandum on the organization of a Museum of Economic Geology for the North-Western Provinces of British India, submitted by Lieut. BAIRD SMITH, of the Engineers, agreeably to the request of the Society.

Ordered—That a copy of the Memorandum be forwarded to Government, and the original made over to the Secretary for publication in his Journal.

Read letter from Mr. H. COPE, of Mussoorie, offering his services for the collection of Lichens, for the purpose of assisting the researches set on foot by Mr. FID-DINGTON, for the extraction of colouring matter from them.

Read letter from Mr. Secretary BUSHBY, of 15th September 1841, intimating that the Resident of Indore had been written for information respecting the Nurma Cotton, and for specimens of the seeds and soils, and that a communication would be also made to the Lieutenant Governor at Agra, that reference may be made to the Sudder Board of Revenue at Allahabad, and to Mr. BRUCE of Bundelcund, who is stated to be well acquainted with the Nurma Cotton of Malwa.

Report for the Month of September, by the Curator.

ANIMAL KINGDOM.

"The arrival of two large and double glazed cabinets in the Museum, for the reception of the stuffed specimens of Mammalia, at the time of my taking charge of the Society's collections, has occasioned me to bestow more particular attention on this department, during the brief period that has elapsed since I assumed the duties of the Curatorship, and I have accordingly inspected and properly arranged what few specimens there as yet exist illustrative of the living Mammalia of India, and have labelled every species with its synonyms, so far as I have been successful in determining the latter.

"With the important accessions in this class with which the Museum has been enriched during the past month, the entire number of species of which we possess some portion, more or less, amounts to 147. There are eighty stuffed specimens, pertaining to 64 species; and seven other species may be considered as temporarily represented by imperfect skins; indeed, many of the former require exceedingly to be replaced

by better specimens. The number of perfect skeletons is 28, comprising several large and valuable species; besides which, we have nearly all the bones of the Malayan Tapir, and of a large species of Whale, with a few belonging to some other species: of skulls, there are examples of fifty-four species additional to the thirty represented by the entire (or nearly entire) skeleton; and the remainder of the collection consists of a few specimens of Bats, and one of the Sylhet Mole, preserved in spirits, the frontlets and horns of various Ruminants, and a few specimens of tusks and other parts, being all that we possess of their species, and comprising those of the Narwhal, Hippopotamus, Phacochære, the molars of the Cachalot, &c.

"It will interest Zoologists in Europe to be informed that the spoils of the identical specimen of the Sumatran Orang-utan described by DR. CLARKE ABEL in the 15th Volume of the "*Asiatic Researches*," and to which so gigantic a stature has been ascribed, are still preserved in our Museum, in so favourable a condition that I have even had the skin cleaned and mounted, which has enabled me to examine the specimen minutely, and to ascertain positively the fact of its possessing the same cheek-callosities as the great Bornean Orang-utan; the omission of Dr. ABEL, to notice this conspicuous and unsightly feature in his elaborate description of the specimen, has induced a suspicion that the remarkable character in question would prove not to exist in the Orang-utan of Sumatra; nor was I able to satisfy myself of the presence of the callosities until the skin of the face was moistened and rendered pliable, when they became conspicuously apparent. This will account for their not having been remarked by Dr. ABEL, as that naturalist took his description from the dry skin, as I first saw it. The individual being merely adolescent, the callosities on the cheeks had not attained the frightful extent of development figured by M. TEMMINCK, in the instance of the fully mature Bornean Orang; nor had its beard grown to nearly so great a length. With regard to the size of the animal, the statement of Capt. CORNFoot, that "he was a full head taller than any man on board (his ship,) measuring seven feet in what may be called his ordinary standing posture," (*As. Res.* xv, 493,) is an exaggeration to which I can only wonder that Dr. ABEL gave publicity; the length of the body, from shoulder to ham, could never have exceeded two feet and a half, and I suspect was even some inches less; and the animal was thus by no means of the largest size, nor probably quite full grown. I can perceive in it no external difference whatever from the great Bornean Orang, and consider them to be very decidedly the same in species; nevertheless, in the only portion of the skeleton of Dr. ABEL's Sumatran specimen which the Society possesses, namely, the lower jaw, there is a very remarkable difference in form from the lower jaw of a male Bornean Orang of similar age, also in the Museum,—the ascending portion of the jaw being half an inch less broad, while the alveolar portion is considerably deeper, especially in front, and the chin more slanting. I shall take an opportunity of recurring to this subject on another occasion. That individual variation of form occurs, to a considerable extent, in certain details in skulls of the Orang-utan, is now, I believe, generally admitted by those who have had opportunities for observation.

"Considering how many years the valuable specimen which I have been noticing has been exposed to the destructive influences of an Indian climate, hanging from the wall of a room, it is consolatory to find that it is in no respect much injured by such exposure, while it encourages me to hope that, with proper care and attention, the

mounted skins of animals in our Museum may be preserved for an indefinite period, with little more than the same protection which such specimens receive in Europe.

“Of the next genus, that of the Gibbons (*Hylobates*), two highly interesting fresh specimens have been presented by the Right Hon’ble the Governor General, which had died in the park at Barrackpore. One of these is a half-grown female of the Hoolock, or White-browed Gibbon, (*H. Hoolock*, Harlan, *H. Scyrites*, Ogilby, and the brown variety *H. Choromandus*, Ogilby). The specimen is in beautiful condition, and if any doubt could exist of the specific identity of the *H. Scyrites* and *H. Choromandus* of Mr. Ogilby, the present individual would remove that doubt, from the intermediateness of its colouring. The other specimen is a still younger female, also in admirable *pelage*, of the White-handed Gibbon (*Simia Lar*, Linnæus, but not *H. Lar* of Vigors and Horsfield, which applies to *H. Agilis*; *H. Albimana*, Vigors and Horsfield, *S. Longimana*, Schreber, and the brown variety—*Pithecus Variegatus*, Geoffroy, but not *H. Variegatus* of Müller, which refers to *H. Agilis*.) The colour of this specimen is a very pale yellowish brown, and every intermediate shade between yellowish white and deep-black is exhibited by the species, in common with the greater number, if not all, of its congeners; the circumference of the face and the four hands being white invariably. This species of Gibbon is generally brought from Singapore, and according to the most trust-worthy information, is unknown in Sumatra, Java, or Borneo, in each of which islands it is represented by a nearly allied species, respectively peculiar to the island, viz. by *H. Agilis* in Sumatra, *H. Leuciscus* in Java, and *H. Concolor* of Müller in Borneo; whether the last-mentioned is identical with the *H. Concolor* originally described by Harlan, remains to be determined: the present specimen was brought from Moulmein; and it is doubtless the species referred to by the late Dr. Helfer in Tenasserim, as being “the most common species of its genus in the interior, howling most piteously in the solitary forests:” that gentleman also mentions the Siamang (*H. Syndactylus*), as having “been found in the southern parts of Tenasserim, up to the 15th degree of north latitude;” a statement it would be desirable to have confirmed, as this animal was previously supposed to be restricted to Sumatra. Finally, to complete this brief notice of the Gibbons, the remainder consist of the Hoolock upon the hills of Assam and Arracan, and the White-cheeked Gibbon, (*H. Leucogenys*, Ogilby), a species lately characterized from a young individual in the possession of the Zoological Society, and the habitat of which was unknown. My friend and fellow-passenger, Lieut. Beagin, however, of the 2nd Madras Cavalry, recognised the drawings which I possess of this species, as decidedly representing one which he had often seen upon the Malabar ghauts, and forests of the Neelghierries, and which varies as much in shade of colour as the others (the Siamang, perhaps, alone excepted, which has never been observed otherwise than black.) Mr. Beagin had seen and handled a freshly killed specimen of the full-grown male, which taking it under the arms required considerable exertion to lift; the height was about three feet. Speaking on this subject to Mr. Walter Elliott, that naturalist remarked to me, that he had never heard of such an animal in those parts; but Mr. Ogilby, in his treatise on the Apes, (published in the Library of Entertaining Knowledge), states, “We have heard from an officer of high rank and celebrity that there is unquestionably a real Ape in the forests of the Malabar coast: he had often heard the natives speak of it, and not unfrequently heard its cry, *wow-wow*,

in the woods, though he had never actually seen it." Of all these species of Gibbon, it is highly desirable that the Society should possess a good series, illustrative of the principal variations of colour; at present we possess but four specimens, namely the Hoolock just mounted, and a young one in bad condition; and a black specimen of the Lar, which contrasts remarkably with the almost white example that has been just set up. The kindness of Dr. Walker enables me to exhibit an equally pale specimen of the Hoolock. I have had the skulls of all four taken out, and the entire skeleton of the new Hoolock is in course of preparation. I have saved also the *cæcum* with its small *appendix vermiforme* of this specimen. It should be remarked that the individual of *H. Lar* here noticed, possessed 13 pairs of ribs, whereas Daubenton, as quoted by all subsequent writers, found but 12 pairs in the specimen dissected by him. (Vide Buffon, *Hist. Nat.* xiv. 104.)

"When at Madras, two packages of skins were entrusted to my charge, for the Society, the one a donation from Dr. Coles, and the other from David Ross, Esq. The former consisted entirely of those of Mammalia, procured in Travancore. Among them are some highly interesting specimens. Of the genus *Semnopithecus*, there are two species new to the Museum, which previously contained only a half-grown female of the Hoonuman, (*S. Entellus*.) One of these is referrible to the Hooded Semnote, (*Simia Johnii* of Fischer, *Sem. cucullatus*, Is. Geoff., and apparently also the "Leonine Monkey" of Pennant and Shaw.) The specimen is a female, nearly half-grown, but which had not begun to change its first dentition. It would seem to be this species which is indicated in the following passage, extracted from Dr. Harknesse's volume on the aborigines of the Neelgherry Hills, (p. 61.) That author notices—"A number of large black Apes, which kept up a continual rustling among the trees, and every now and then projected, from below the foliage, their grey-bearded visages, chattering, and apparently surprised at our intrusion."* I have been informed that it keeps always to the trees, and never, like the Hoonuman, resorts to houses; this I mention, because nothing has been hitherto published of the habits of the species. The other specimen, if not an entirely new species, is a finer example of the adult male *S. cephalopterus*, (*Cercopithecus latibarbat*us, Desmarest, *C. leucoprymnos*, Otto, *Sem. fulvogriseus*, Desmoulins, *S. Nestor*, Bennett,) than appears to have been hitherto met with by naturalists. Indeed, it differs so much from all the descriptions I have seen of the latter, and from the figure supplied by Mr. Martin, that I much suspect it will prove to be new, in which case I would propose for it the appellation—*S. hypoleucos*.† This animal is nearly allied to the *Entellus*, but considerably smaller, the present apparently aged male measuring about twenty-one inches from crown to base of tail, the tail thirty-two inches, (which accords with the dimensions of *S. cephalopterus*.) The entire back and shoulders, together with the outside of the humerus and thigh, are of a rather deep and somewhat dusky brown, with a tinge of chocolate, becoming paler laterally, and having passed into white on the sides, under parts, and inside of the thigh and humerus; the face, ridge of hairs impending the brow, a few on the cheeks and lips, with the whole tail, and the remainder of the

* Vide a notice, also, in Dr. Royle's Illustrations of the Botany, &c., of the Himalaya Mountains, at the end of a note to p. 30, where the productions of the Neelgherries are adverted to.

† Since writing this, I have seen the *S. cephalopterus* alive in the park at Barrackpore, and can therefore pronounce on its distinctness from *S. hypoleucos*.—Cur. As. Soc.

limbs, deep black, mixed with whitish inside the fore-arm and in front of the leg; crown, occiput, sides of the head, or what are called the whiskers, together with the beard, brownish white, having a faint tinge of the hue of the body upon the vertex; the whiskers are not remarkably lengthened, though very copious, and do not stand out in the remarkable manner stated, as well as figured, of those of *C. cephalopterus*. All that I could learn of this monkey was, that it bore the name of the Travancore Monkey in Madras. The *S. cephalopterus* is only known to inhabit Ceylon.

“The remainder of Dr. Coles’ donation consists of the following specimens and species:—

- Galeopithecus Temminckii*,
Pteropus medius,
Taphozous brevicaudus, Nobis, (a new species, entirely distinct from another in the Museum, which again differs from *T. longimanus* of Hardwicke, the only Indian species as yet described,)
Sciurus maximus, (three specimens,)
 ——— *hippurus*,
 ——— *erythræus*?
Pteromys pataurista,
Gerbillus Indicus, and
Meminna kanchil, (a nearly white specimen from Malacca.)

“Of these it will be sufficient to remark, that the specimens of *Sciurus maximus*, with those previously in the Museum, illustrate the gradations of variation in colour to which this species is subject: while I may also mention that all the examples of genuine *Pteromys pataurista* which I have seen, whereof the habitat was known with certainty, were brought from Travancore;* though it is doubtless the same species of which Major Forbes gives so interesting an account in his ‘Journal of Eleven Years Residence in Ceylon:’ the allied *Pt. nitidus* comes always from the Malay Peninsula and Islands, and the *Pt. magnificus* from the Himalaya. The *Galeopithecus Temminckii* is entirely distinct from the species inhabiting the Phillipines, as lately shewn by Mr. Waterhouse.

Mr. Ross’s donation consists almost entirely of Birds, but contains three skins of Mammalia, and one Reptile; viz:—

- Pteropus medius*? (most probably distinct, but I wait for further data before deciding,)
Megaderma lyra,
Herpestes griseus; and the Reptile,
Varanus binotatus (*Lacerta binotata*, Kuhl.)

The following are the Birds:—

- Upupa Epops*,
Alcedo Bengalensis,
Halcyon Smyrnensis,
Merops Phillipinensis, (adult and young,)
Coracias Indica,

* The Society has since received this species from Moulmein: and the *Pt. Oral* of Lt. Tickell, (described in the *Calcutta Journal of Natural History*, No. 7, p. 401,) would seem to be no other.—Cur. As. Soc.

Bucco Indicus,

Eudynamys orientalis, (male and female, remarkable for the great sexual diversity of plumage,)

Centropus pyrrhopterus,

Lanius Hardwickii,

Lanius minor?

Copsychus saularis, (Wagler,)

Hæmatornis, (Swainson,) a species nearly allied to *H. Caffer*, but much smaller, having the upper parts, with the hind-neck and breast, of a hair-brown colour, slightly fringed (as in *H. Caffer*) with greyish, and the under-parts dull-white, mixed with brown anteriorly; in other respects a miniature of *H. Caffer*: entire length $6\frac{1}{2}$ inches; of wing $3\frac{1}{4}$ inches; tail $2\frac{3}{4}$ inches; tarse $\frac{3}{4}$ inch, and bill from forehead $\frac{1}{2}$ inch. Should it be undescribed, I propose for it the appellation *H. pusillus*.

Pitta brachyura,

Oriolus aureus,

Euplectes Phillipensis,

Pyrgita Domestica,

Cinnyris Mahrattensis, (two specimens,)

——— *sola,*

Perdix Argoondah, (male and female,) *Coturnix Argoondah,* Sykes,

Hemipodius pugnax,

Glareola torquata,

Tachydromus Asiaticus,

Parra Sinensis, (adult and young,)

*Himantopus melanopterus.**

"I have also to acknowledge the donations of a fresh-killed specimen of *Pteropus medius* from Mr. J. J. Maclean; of a fine Alexandrine Parroquet, (*Palæornis Alexandri*,) from Mr. L. Swarries; of a Bat, (*Scotophilus castaneus*,) from Mr. Bouchez; and two young Bats, of a species nearly allied to the European *Pipistrelle*, have been picked up in the compound surrounding the Museum.

A large box of Insects, collected in the Australian settlement of Swan River, has also been presented to the Society by Mr. Crichton of that place, containing many interesting specimens, and especially valuable for the number of duplicates comprised, the importance of which, properly distributed, need not be further adverted to. The collection contains 287 specimens, referrible to about 80 species, and the *Coleoptera* outnumbering all the other orders. A considerable number of native insects have been taken by a person I have employed for the purpose.

"In the Osteological department, the skeleton of the Rhinoceros, which was much soiled and badly set up, has been taken to pieces, cleaned, and is now in process of being remounted. Several small skeletons are also in course of preparation, and some skulls have been added to the collection. A skin of the Yak, (*Bos grunniens*,) which,

* The whole of these specimens were collected in the Zillah of Chingleput, as Mr. Ross has since informed me.—Cur. As. Soc.

for five years, has been hanging to the wall of one of the apartments, I have had moistened and stuffed, and the skull, which was wanting in the collection, taken out and cleaned. The mounted skin now forms a very good specimen of the stuffed animal.

MINERAL KINGDOM.

But a single donation has arrived during the past month in this department, consisting of six specimens, presented by H. B. Hinton, Esq. for the Museum of Economic Geology; viz:—

- One example of Granite Rock in the Ganges at Puturghat,
- One of Hornblende, from Sicrigully, Rahjmahel,
- Trap, called Whinstone by Buchanan, from the same locality,
- Kunkur, ditto,
- Quartz, 'fat and mealy,' ditto, and
- Iron, ditto.

"Lastly, Dr. Lloyd has sent for deposit in the Society's Museum, a Deep Sea Clam and Cylinder, of which every care will of course be taken."

The Secretary, before reading the foregoing report of the Curator, (Mr. BLYTH,) took occasion to introduce him to the meeting, and proposed that the services of Mr. PIDDINGTON, late Curator, be suitably acknowledged.

The best thanks of the Society were accordingly accorded to Mr. PIDDINGTON, for his valuable services during the time he officiated as Curator, and hope expressed that he would continue to afford his services in the good cause which he has as much at heart as the Society, to promote.

Read a proposal from Molovi Abdoollah to reprint in Persian, the "*Hedayah*," and soliciting the patronage of the Society for the undertaking, by their subscription for 100 copies.

This proposal not coming within the province of the Society, it was proposed by Dr. HÆBERLIN, and seconded by the Secretary, that the Society subscribe for five copies, as an encouragement to the Molovi for his undertaking.

The proposal having been put to the vote, it was lost by a shew of hands: ordered, therefore that the proposal be declined, and the Molovi informed accordingly.

Read letter of 1st October 1841, from Dr. HÆBERLIN, submitting his reasons for proposing that Professor H. EWALD, of Tübingen in Wirtemberg, be elected an Honorary Member of the Asiatic Society of Bengal.

Read report from the Secretary and Officiating Curator of the Society of the 18th June last, with correspondence on the subject of the Geological Collections of Capt. HUTTON.

Ordered, that the subjects of two foregoing papers be submitted to the Committee of Papers for consideration and report.

Read the following report from the Librarian for July last:—

SIR,—I have the honour of transmitting to you my report of last month, requesting you to lay it before the Committee of Papers.

It was highly encouraging to me, that the plan which I had the pleasure of proposing for a new arrangement of the Library and Catalogue met, in its general features the approbation of the Committee.

In compliance with their request, I now beg to state what progress has been made in the new arrangement during the last month, premising, that it was commenced on the 19th ultimo, when I received a communication from you concerning the resolution of the Committee.

The classification adopted for the Classic Literature, is as follows :—

I.

CLASSIC LITERATURE.

1.

Greek Literature.

A. Philosophy,

B. History,

C. Geography,

D. Miscellaneous Works.

2.

Roman Literature.

This division of the new catalogue has been completed, and the books of the Library referring to it, have been arranged accordingly.

The classification of the second division is also commenced, and the works, belonging to its first head, viz. Theology, have been entered into the catalogue; the arrangement has proceeded to the heads of Jurisprudence, Medicine, and Philosophy.

The following is the classified arrangement of Theology :—

II. Literature of modern times from the commencement of the Christian æra to the present age.

I.

Theology.

A.

Polytheism.

A

B

Special forms of Polytheism :
a. Religion of Egypt.

b. ——— of Greece and Rome.

c. ——— of Zoroaster.

d. Brahmanian.

e. Buddhism.

f. Religion of Confucius.

B.

Monotheism.

A

B

Judaism. Christianity. Muhammedanism.
a. Holy Scriptures and their parts.

b. Biblical Criticism and Interpretation.

c. History of the Christian Church.

d. Miscellaneous Works.

C.

Pantheism.

C

I beg to observe with regard to this classification, that the subdivisions have of course been made according to the number of works in the Library, as a complete arrangement cannot be made, except there be a number of books sufficient to represent the co-ordinate divisions of a branch of Literature.

I add two lists which have been prepared during last month for the consideration of the Committee, one of all the defective works in the Library, specifying the volumes which are wanting, as many of these works contain the most important information about subjects intimately connected with the purposes of the Asiatic Society, which renders it very desirable to have them completed.

The second contains the number of books which require to be rebound. With regard to them I would observe, that though the expense of putting them into good condition, may be considerable, the preservation of so many excellent works will justify the outlay; for should they be allowed to remain in their present state, most of them will soon be so far destroyed as to be of little or no service in the Library.

Should the Committee resolve to have these books rebound, I would take the liberty to suggest, that several respectable Book-binders be requested to send in their estimates. I would also remark that, when books, requiring to be bound, are many, as for instance in a Public Library, the prices ought to be something less than the common rates.

The rate for the binding of books, as fixed at present, appears too high, as the accompanying list of the respective rates apparently shews.

11th August, 1841.

I have the honour to remain, Sir,

Your obedient servant,

E. ROER.

Read report by Mr. PIDDINGTON, on the Cylinder found on the hills near Herat, and presented to the Society by Major E. POTTINGER, which the Secretary informed the Meeting he would print in an early number of his Journal.

Read letter of 1st September 1841, from Lieut. A. CUNNINGHAM, of which the following is a copy:—

MY DEAR TORENS,

Lucknow, 1st September.

The Silver Plate of which you have got 500 lithographed copies, appears to me to represent most unquestionably the portrait of Sapor II. or Shahpuhr Zu'l Aktaf, or Zu'l Aknaf; for in the list of the Sassanian Kings, whose dresses are described in the *Majmul-ut-Towarikh*, I find that he is the only one who has a crescent on his crown. His dress is thus detailed, a rose coloured tunic; red pantaloons; a crown of blue and gold, embroidered in different colours, surrounded by two circles of gold, and ornamented with an embroidered crescent.

Do you think then that *Zu'l-Afkun*, or "Lord of the Lion," might be substituted for *Zu'l-Akta'f*, "Lord of the shoulders"; and *Zu'l-Akna'f*, "Lord of the wings?" The last of these is supported by the wings, which appear on the head-dress of so many of the Sassanian Princes?

Yours sincerely,

A. CUNNINGHAM.

For the Contributions and Presentations thanks were accorded.

JOURNAL

OF THE

ASIATIC SOCIETY.

Report on the Tin of the Province of Mergui. By Captain G. B. TREMENHEERE, Executive Engineer, Tenasserim Division.

1. The tin of this province has not been sought for since the Burmese took possession of the country from their Siamese neighbours. Under the rule of the latter, or during the period at which Tenasserim was an independent state, extensive works for tin were carried on. It occurs chiefly in the beds and banks of streams issuing from the primitive mountains, which form the principal feature of this peninsula; portions of the banks of streams in which it is found are, in some instances, rivetted with rough stone-work, to confine the water for washing operations; and the ground on either side, for many miles along their course, is penetrated by innumerable pits, from eight to ten and twelve feet deep. Traces of the work of many thousands of men are evident in several places. These pits are not connected with one another, but seem to have been sunk by separate small parties of men, to whom probably definite tasks were assigned, with a view of tracing the tin ground, and of extracting the gravel with which the tin is mixed.

Their variable depth, and the amount of labour expended on them, is a tolerable indication of the success with which this has been pursued, and of the places in which ground might be again perhaps opened with advantage.

2. The streams themselves are rich in tin, which may be collected from their beds in considerable quantities. The process by which it has been deposited for long periods, and for many miles along

the line of valleys through which they flow, appears to be in active operation at the present day. Crystals of the peroxide of tin washed down by the rivers, and deposited with sand gravel in their beds, may, by changes of the river's course during the freshes, be quickly covered with a few feet of gravel and soil. The older deposits have, as far as my observation extends at present, the same alluvial character, and it would be well in future operations to have regard to the levels in which the streams may have formerly run.

The first of these localities which attracted my attention, was the Thengdon river, issuing from the primitive mountains in the immediate neighbourhood of the coal mine on the Great Tenasserim river. I visited this river in the course of my survey of the coal basin, and found pits in great number along its banks, of the existence of which I had been previously informed, though the object for which they had been dug was not known to my informant. On washing some of the gravel from the bottom of one of the pits, a small quantity of tin was found.

3. A Shan was subsequently sent there, and collected 11,889 grains of tin of the native peroxide in the course of an hour and half. Specimen No. 1, which is equivalent to 19 ounces and 198 grains of pure tin.

4. After leaving the vicinity of the coal mine, I proceeded down the river, and was accompanied by the Shan, who had been employed in tin works in the Straits, and to whom several tin streams in the Mergui province were known. These are situated chiefly on the Little Tenasserim river, into which they empty themselves. The first and most accessible is the Thabawlick, which unites with the Thakiet three miles above the junction of the latter with the Little Tenasserim. The mouth of the Thakiet is eleven miles from the town of Tenasserim.

5. The access to this tin ground is by land in the dry season. Landing at the village of Thakiet, I proceeded on foot eight miles, and reached the Thabawlick, at the point indicated in the accompanying sketch.

6. The intervening ground is for the most part flat. After passing a marsh of some extent, there is a low ridge of hills, which presents, however, no obstacle to land carriage of any description. The face of the country is, as usual, except in marshy places, thickly covered

with jungle trees ; but the wild elephants' tracks are open and convenient. During the monsoon, boats carrying 100 bags of rice, can ascend the Thabawlick to the place alluded to, in one day. The tide is felt about six miles from its mouth.

7. Having arrived at the spot at a point known to my guide, and at which he had the previous year stationed himself for a few months, for the purpose of collecting tin, I found numerous pits and old cuttings, from which tin had been formerly obtained. It is found in layers of gravel immediately beneath the soil. The surface is undulating, and during the wet season, streams of water could have been conveniently conducted near the excavations, for the purpose of washing the gravel.

8. The guide stated, that crystals of tin could be in this manner separated by the hand without the usual aid of the washing trough. The rains not being at that time sufficiently advanced for that purpose, I did not succeed in obtaining any tin from the pits. The line of deposit of the richest stanniferous gravel has been probably influenced by many causes, and the chances of finding it are much the same as those to which other undertakings of this nature are subject. A few trials, however, across the low ground through which the hill streams pass, would enable the speculator to follow its course.

9. The time of the tin washer was, I found, much better occupied in seeking for tin in the bed of the river. He was assisted by one man, who disturbed the sand and gravel with his feet to as great a depth as he could thus accomplish, when a conical and shallow trough, about two feet in diameter and ten inches deep, was filled with the same, and washed in the stream by a circular motion, so as to get rid of the gravel and lighter particles, leaving the crystals of tin to collect, by their gravity, on the apex of the hollow trough. Each filling and washing occupied, on an average, six minutes.

One washing produced 1041 grains of native peroxide of tin in six minutes.

Specimen No. 2, equivalent to 1 oz. 335 grains of pure tin.

One do. do. 1265 grains of do. do.

Specimen No. 3, equivalent to 2 oz. 31 grains of pure tin.

One do. do. 1785 grains of do. do.

Specimen No. 4, equivalent to 2 oz. 430 grains of pure tin.

One hour's work apart from the above, 8,166 grains of pure tin.

Specimen No. 5, equivalent to 13 oz. 160 grains of pure tin.

Total of half a day's work, including the above, 25,406 grains, equivalent to 2 lb. 9 oz. 232 grains of pure tin.

Specimen No. 6, contains of the latter, 13 oz. 149 grains.

The price of labour in this province is 6 annas per day.

10. The produce of a day's labour of two men would be, according to the above trial, equivalent to 5 lb. 2 oz. 464 grains of pure tin, at the cost of 12 annas, exclusive of the expenses of reduction to the metallic state. This process, from the pure state of the mineral, is extremely simple and inexpensive. The tin collected in the trough would require one more washing to remove particles of sand, &c. and charcoal is the only fuel required for its reduction.

The pieces or ingots of tin in the shape of the frustrum of a cone, (Specimens Nos. 7 and 8,) which are manufactured at the Rehgnon mines, on the Pak Chum river to the southward, and exchanged there for goods at 4 annas each, weigh 1 lb. 2 oz. 383 grains; and their value at Mergui, where the average price of tin is 85 rupees per 100 viss, of 365 lbs. 4 annas 4 pie. The value therefore of 5lbs. 2 oz. 464 grains, or the day's work of two men, would be 1 rupee 8 annas 4 pie. The cost of collecting being 12 annas, leaves 12 annas and 4 pie for the cost of the reducing process, and for profit on the labour of two men.

11. On the morning after reaching the Thabawlick, I traced the tin ground for a mile in a N. N. E. direction. The pits are in some parts more abundant than in others; and I was informed that they occurred and were thickly scattered throughout the entire course of the river between that point and the hills from which it issued, at the distance of an entire day's journey, if the windings of the river are followed.

12. The pits have not been worked since the Burmese took possession of the country. At the head of the stream, there are said to be the remains of bunds constructed for distributing water for washing the tin, and the posts of a house still standing, which is supposed to have been occupied by a Siamese superintendent of the work there carried on.

The season was too far advanced to enable me to prosecute my inquiries towards the hills on this occasion, and my attention was

therefore confined to the spot from which I obtained the results detailed above.

13. Four other rivers emptying themselves into the Lesser Tenasserim, are said to produce tin, but none are so accessible as the Thabawlick.

The following are the names of these streams, with their distances from the Thakiet river :—

The Khamoungtang River, one day by the Little Tenasserim, and one march inland.

Engdaw River, no road through the jungle.

Kyeng ditto, two days by the river, and two days inland.

Thapyn ditto, three days by the river, and one march inland.

From the Khamoungtang specimen, No. 9, weighing 2,890 grains, was collected in ten washings, but I did not visit the place myself.

The size of the tin is larger than that collected in other places, though the produce is not equal in quantity.

14. After returning to Tenasserim, I visited Loundoungin River, where tin was said to exist, but it turned out to be Wolfran sand, which had been washed down from the adjoining slate mountains, and was lying on the surface of the sandy bed of the stream.

15. In proceeding down the Great Tenasserim River towards Mergui, I halted at Moetong, for the purpose of visiting a tin ground which was said to exist near the range of hills to the N. E. skirting the open plain in which this place is situated. On penetrating to the hill itself, I found it to consist exclusively of granite, with not a trace of another rock of any description. The dry beds of the water-courses consisted of granitic sand alone.

There were many excavations for tin on the face of the hill. Several loads of gravel from the bottom of the pits and from the beds of the water-courses were carried to the river and washed, but the out-turn of tin was very small. There is no water within convenient reach.

16. The next spot visited was Kahan, a small hill near the Zedavoun Pagoda, on the right bank of the Great Tenasserim River, 11 miles from Mergui. The tin occurs here under conditions differing much from that of the localities above mentioned.

Kahan itself is the highest portion of a low ridge of hills, not more than 200 feet above the level of the river: it is composed of a soft,

friable, white sand-stone rock, the upper portions of which are decomposed and irregular. The surface gravel does not contain tin. It is found in the crystallized form, interspersed in decomposed granite, forming a vein about three feet wide, which is enclosed by the white sand-stone rock, and dips down at a high angle with the horizon. Specimen No. 10, if its form be preserved, illustrates well the tin crystals imbedded in the decomposed granite, which are easily detached from the matrix. The Specimen No. 11, from the same vein, of a yellow colour, is considered the surest indication of the presence of the mineral, and lies below the white, No. 10. Large scales of chlorite occur with it, which as they are generally found where the tin is most abundant, is called by the natives the mother of tin. The face of the hill is in one spot scattered over with these, which appear to have been brought down from the vein, with other matter from which the tin has been separated by the usual mode of washing. It will be noticed, that the granite is completely decomposed, and that the crystals would be easily separated by washing. No tin has been raised here since the country came into our possession, but the locality has been known. It was worked during the Burmese rule, and valued as supplying the richest ore of tin. A Burmese residing near the spot, pointed out the place where his operations had ceased. He had followed the direction of the vein alluded to, as well as he was able, and had driven a gallery underground in an inclined direction upwards, till the bank above fell in, when the mine was abandoned. He stated, that he had procured considerable quantities of tin daily, and that he often found it in large masses mixed with the yellow ground above mentioned. Arriving at the spot where his work had terminated, I set people to excavate and find, if possible, the vein which had been described. It was reached after about two hours digging, at the depth of five feet from the surface of the cut in the hill, in which we stood. In about a quarter of an hour, a few baskets of the decomposed granite were removed down the hill, from which 3,900 grains of the crystallized peroxide of tin, equal to 63,176 grains of pure tin, Specimen No. 12, were collected; and the next day 23,400 grains, equal to 2 lbs. 6 oz., and 100 grains of pure tin were found in the same manner by one man's labour in excavating; one carrying down to the water, and a third washing.

17. This locality appears to be of very promising description, and I have little doubt that if the work were aided by ordinary skill and means, that a tin mine here would be productive. A vein of tin is, in fact, exposed to the day, and would only require for a considerable period of work the precaution of well-supported galleries and shafts, to allow of its contents being easily extracted.

The Kahan hill is, I conceive, an indication of a valuable repository of tin. It is but a quarter of a mile from the creek communicating with the river, which is accessible to any boats. Its proximity to Mergui, offers also great facility for the procuring of labour and supplies.

18. The localities, therefore, which appear to hold out the best prospects for tin are, first, for stream tin, the Thabawlick river and the Thengdon river; and for mine tin, the Kohan hill. They all produce tin of the same nature and quality; viz. crystals of the native peroxide, being a combination of oxygen and tin only.

19. No difficulty would be found in procuring labour from Mergui for carrying on tin works at either of these places.

20. The location of the coal mine on the Great Tenasserim river has given rise to much additional cultivation along the banks of that river, where there are many Kareen villages, from which parties on the Thengdon could be supplied. Fruit trees, not indigenous to the place, and other traces of a considerable population having once occupied its banks, are observable on this river. The banks of the Little Tenasserim are thinly occupied by Siamese villages. The country in this direction, except near the banks of the river, is utterly unpeopled, and appears always to have been so.

21. Communication by water from the Thakiet to the Thabawlick tin ground, is not open in the dry season, but the distance by land is short. The produce of two lines of country, that of the vicinity of the Great and Little Tenasserim rivers, passes the town of Tenasserim at the junction of these rivers, only 11 miles from the Thakiet, and no difficulty in procuring subsistence for working parties on the Thabawlick need be apprehended.

(Signed) G. B. TREMENHEERE,

Capt. Executive Engineer,

Tenasserim Division.

Moulmain, 31st August, 1841.

Report on the Manganese of the Mergui Province. By Captain G. B. TREMENHEERE.

1. During my stay at the Tenasserim coal basin, a piece of manganese ore (black wad) of good quality, was brought to me by a Kareen, who stated that it had been found accidentally in the bank of a stream called the Thuggoo, which enters the Great Tenasserim, seventeen miles below the coal site. Subsequently, several other pieces of the same ore were brought by Mr. T. A. Corbin, Assistant to the Commissioner from the Therabuen river, five miles above the Thuggoo, and from an intermediate spot, the locality of which had been previously known, and had been, I believe, originally pointed out by Lieut. Glover, of the Madras Army.

2. In proceeding down the river, I visited these spots, and found at each that a valuable bed of manganese ore existed close to the surface of the country. It had been apparently cut through by the action of the streams and river before mentioned, leaving a section of the bed of ore in their banks covered only by the debris of the banks themselves. Large quantities might have been carried away, but a few hand specimens only were taken, which sufficiently shew the nature of the deposit, and are fair samples of what might be easily collected.

3. The best Specimens, No. 1 and 2, are from the Thuggoo river and the bank of the Great Tenasserim. That of the Therabuen did not appear to be at the surface of so pure a quality, but the existence of the bed being known, it is perhaps premature to pronounce it an inferior ore, from the examination of specimens taken from a hole extending not two feet into the bank. No. 5 is a portion of manganese rock projecting into the Great Tenasserim river, near the mouth of the Therabuen stream.

4. For the localities above mentioned, I must refer to the sketch accompanying my report on the tin of this province recently forwarded.

5. Of the extent of these manganese beds, it is difficult to pronounce. The face of the country in which they are situated is flat, thickly overspread with soil, and with the densest jungle. It is not, as far I could perceive, intersected by many streams, which would afford

the means of tracing the mineral deposit. The Great Tenasserim river has passed through the manganese bed in one spot $2\frac{1}{2}$ miles removed from two other points at which it occurs to the north and south, at both of which it is likewise discovered near the surface by the action of the streams Thuggoo and Therabuen, the probability therefore is, that it is an horizontal deposit, covering many square miles. But without indulging in conjecture, there is sufficient at the localities referred to, to indicate large quantities of manganese ore, which could be collected by penetrating through the soil lying above it, and immediately near the spots in which it is now exposed to the day.

It occurs in the form of the black oxide, and is the manganese of commerce. It is largely consumed in Europe in the preparation of bleaching compounds, and when pure, is valuable to the manufacturers of glass.

The soft black ore, No. 1, is a hydrate of the peroxide of manganese, known under the name of wad. It contains of water two equivalents or 9 per cent.

Iron, 1.96 grains by analysis.

Its specific gravity is 1.47.

The specific gravity of the grey peroxide, No. 4, is 2.46.

(Signed) G. B. TREMENHEERE,

Capt. Executive Engineer,

Moulmain, 11th September, 1841.

Tenasserim Division.

Of a new species of Lagomys inhabiting Nepal, (with Plate,)—*Lagomys Nepalensis*, Nob. By B. H. HODGSON, Esq. Resident at the Court of Nepal.

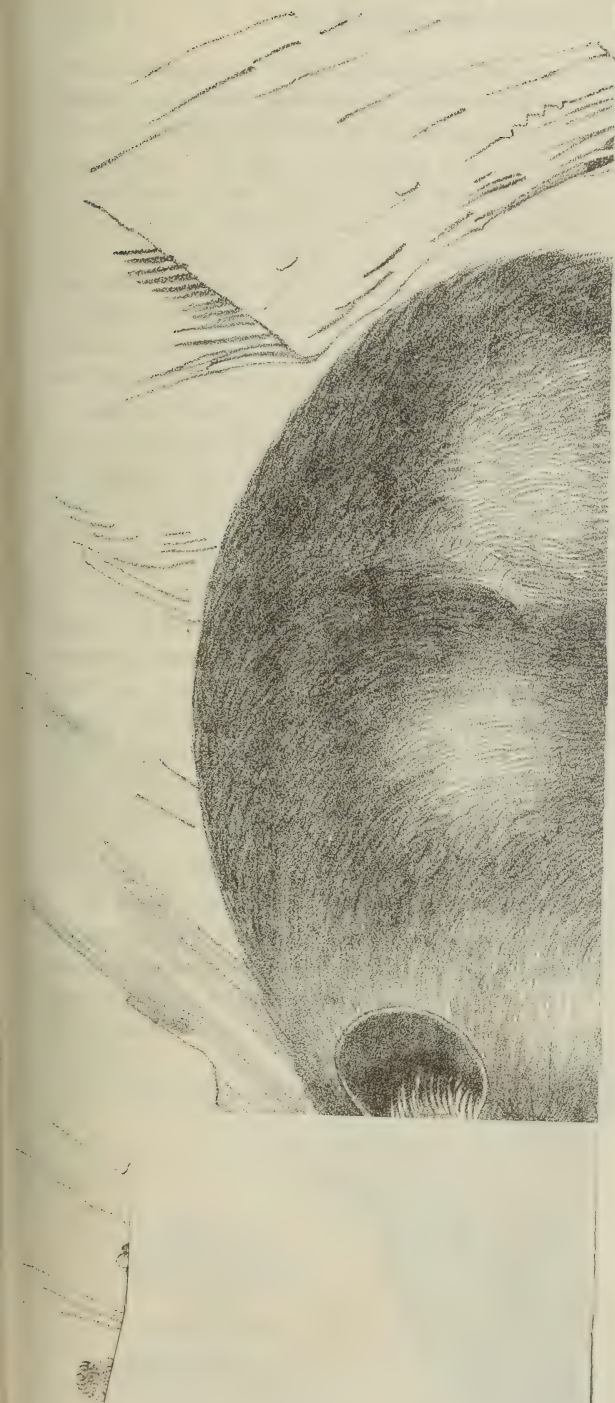
Two fine specimens, male and female, lately received from Gosainthan, enable me to add the genus *Lagomys* to the Catalogue of Nepalese Mammals, and it may be remarked as characteristic of the enormous and sudden inequalities of elevation proper to this kingdom, that the tropical genus *Rhizomys*, and the arctic genus *Lagomys*, have been taken within 40 miles of each other.

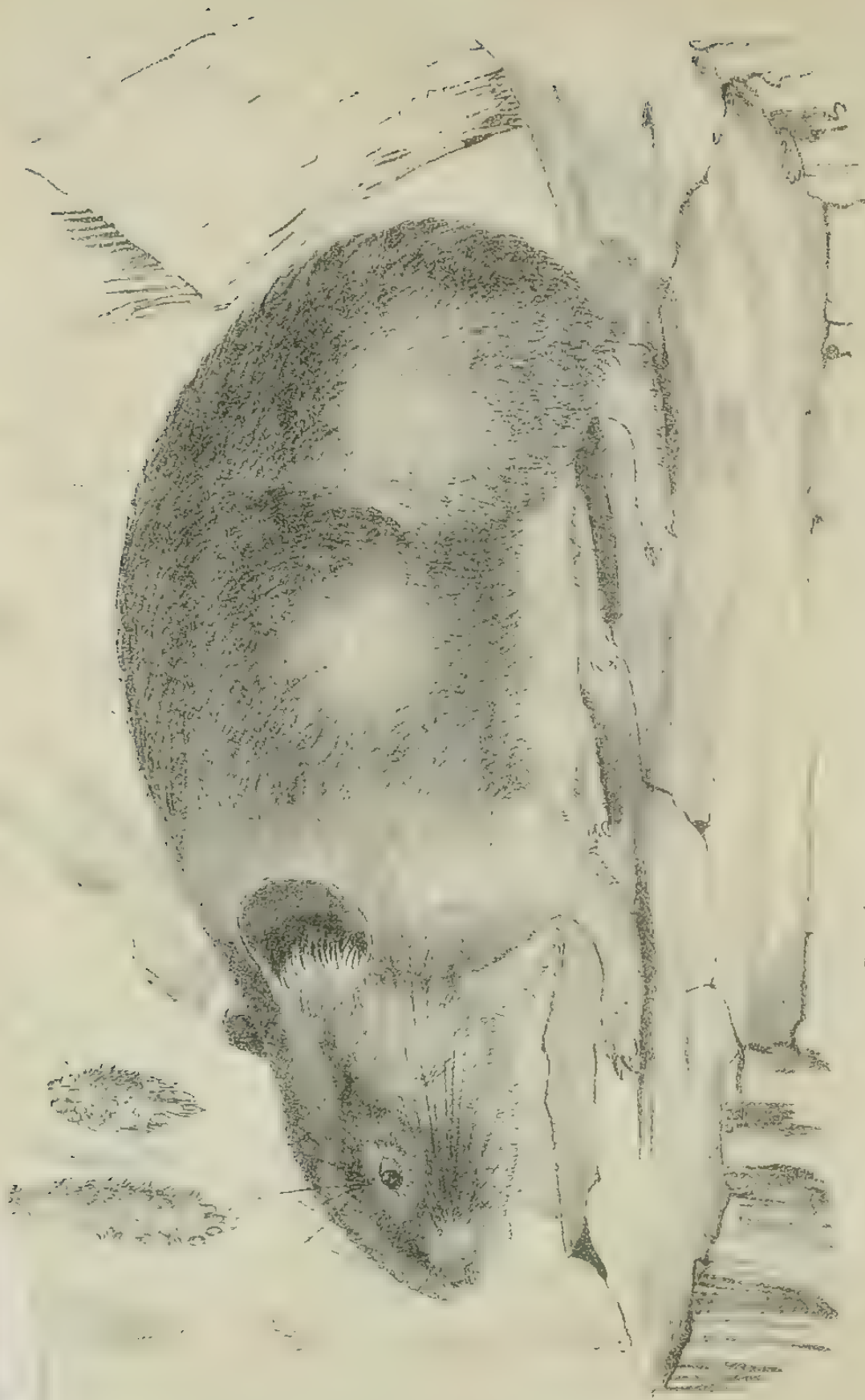
The specimens of the latter genus just procured by me, were shot by my hunters on the margin of the sacred lake whence the Trisal Ganga River issues, and close to the verge of perpetual congelation. There were but a pair, of which both were obtained, as they moved about in the vicinity of the small natural cavity, or rocky fissure, that formed their abode. Their stomachs were full of fresh vegetable matter, like the contents of a hare's belly, nor was there near their abode any evidence of the hoarding propensities of the genus, or of a habit of digging for food. The height of the summer being the season at which the animals were taken, may explain the former circumstance however, but not the latter, and though it is said that these Rat-Hares dig for their food occasionally, I fancy this must be a mistake.

My species appears to be nearly allied to *Roylii*, and possibly may be identical, but I think not, and shall therefore give a summary description of it, which with the beautiful drawing of my painter, will serve at once to decide this specific distinctness or otherwise. Gosainthan, where the pair were killed, is not above 30 miles north of Catmandoo. No European has ever visited it; but as it is on the verge of the perpetual snow line, it cannot be much less than 16,000 feet above the sea.

The male of the pair is seven inches long from snout to vent, and the female half an inch less. The general appearance of the species is that of a Guinea-pig, but the natives of India, who know no such animal, liken it to a Rat, and as its Leporine teeth and soles (of the feet) are not obtrusive signs, the association of it to the Murine race seems natural enough. Its general likeness, for instance, to the *Rhizomys* or Bamboo Rat is very noticeable, particularly as the latter is apt to hide its tail. But a nice observer will at once mark the greater superior massiveness of the head in *Rhizomys*, together with the smaller eyes and ears, and will not be slow to refer these peculiarities to the highly fossorial habits of that genus.

Our present subject which, we shall name provisionally "*Nepalensis*," has a moderate hare-like head, but ears quite similar to those of the common Rat, with the exception of that small internal process near the conch,





Lagomys nipponensis new nat. size.

H. Allen & Co. Lith.

which seems proper to the *Lagomides*. The ear is rather less than half the length of the head, is truncated, rounded, and nearly nude except on the anterior and incurved edge of the helix, where very short hairs are pretty closely set. The upper and outer pair of front teeth have a very deep longitudinal groove, so as to look like four instead of two, but neither these, nor the inferior pair are at all remarkable for size or strength, offering in this respect, a strong contrast to *Rhizomys*. The inner pair of upper teeth are palpable, but minute. The whiskers are long, and firm, reaching to the shoulders; the lips and the muzzle entirely furred: the eyes medial: the body full and cylindric: no vestige of tail: the limbs short, but fine, and of nearly equal length and strength before and behind: pentadactylous before, tetradactylous behind: the nails acute: the soles fully clad, except the termino-digital balls, and a tiny carpal pad placed a little behind the elevated thumb. The last named are the sole parts of the whole body, which are denuded of fur. The fur of the animal is *Leporine* in the general character, but softer and more silky. It is of one sort, about an inch long, and of uniform structure throughout each pile, or hardly perceptible, harsher in its apical portion. On the head and limbs the fur is shorter, more adpressed, and less silky. The general colour, internally, is blue black, but externally is deep bay from the snout to the mid-body, and black freckled with paler rufous, thence to the vent. Below the chin and belly are pale bay, and the limbs are the same. There is a pale spot, or tuft rather, at the outer base of each ear, and the mustachio is half dark and half light.

The following specific character may, for the present, indicate the animal:—

Lag. Nep. with broad, rounded, nudish ears, nearly half the length of the head, soles nude on the termino-digital balls only, and soft equable fur, which is dark bay from the snout to waist, and rufescently freckled, black thence to the vent: below and the limbs, paler bay; snout to vent 7 inches: head 2: ears $\frac{7}{8}$: palm (with nail) $\frac{3}{4}$: planta (with nail) $1\frac{1}{4}$: female similar, smaller, $6\frac{1}{2}$ from snout to vent. Habitat, Himalaya of Nepal.

Catmandoo, August, 1841.

Notice of a new form of the Glaucopinæ, or Rasorial Crows, inhabiting the Northern region of Nepal—Conostoma Æmodius, (Nobis type.) By B. H. HODGSON, Esq. Resident at the Court of Nepal.

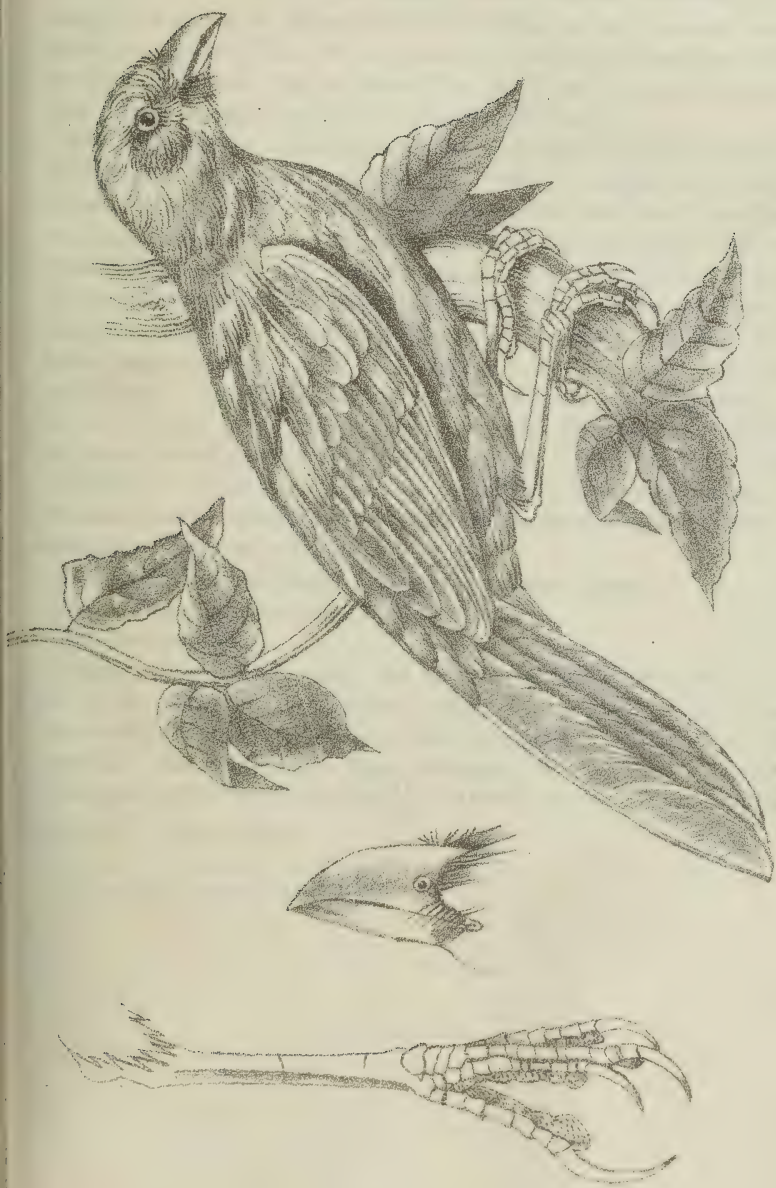
Amongst the very numerous forms* presented by the 850 species of Birds already known to me as inhabitants of Nepal, there is one which I believe to be still new to science, and to belong to a group, of the occurrence of which, either in these mountains or in the plains at their base, I know of no other instance, save that of the ubiquitous tree Magpies.

The group alluded to, is the Glaucopin, or Finch-billed Crows of Swainson; and the single species I am acquainted with, tenants exclusively the immediate neighbourhood of the perpetual snows.

In the lower and central regions, our bird appears to be represented by the Timaliæ and Crateropi, to both of which, and especially to the former, it bears in much of its structure, the same close resemblance that it does also in its manners; for all these birds alike have lax feeble plumage, short rounded wings, longish, broad, frail subgradated tails, and very large, yet not typically, terrestrial feet, though the habits are essentially terrene and rasorial. But, whereas the Timaliæ and Crateropi have a more or less Meruline bill, slender, and provided with membraned and open nares. The present birds, which we shall denominate generically Conostoma, (*κωνος* et *στομα*), have the massive bill and simple concealed nares of the Magpies. The bill of the Crypsirinæ vel Dendrocittæ, or tree Magpies in particular, has much resemblance to that of the Conostomæ, owing to the clear arcuation of its whole commissure, and to the perfect entireness of its tip. There are differences, however, between the two even in the bills, in as much as that of Conostoma is more compressed, with sides less tumid yet broader ridges; while in Crypsirinæ, the other members, such as the long gradated tail, short tarsi, and considerably pointed wings, indicate habits less terrestrial than those of our bird. Conostoma is clearly a typical example of the Glaucopinæ of Swainson,

* One of the most remarkable of these is the Cochoa of Nepal, and which was characterised by me under that name in the Journal for June 1836. The expert naturalist would immediately perceive what my inexperience then noted not, viz. that this is a typical *ampeline* form, requiring to be placed between Ampelis and Casmarynchus, though Swainson asserts that the group is exclusively American.

To this genus we have since given the classic name of Prosorinia. In the same number of the Journal is the description of yet another rarity, first discovered and described therein, and which Swainson has since called Nyctiornis. It is our Bucia hodie, Napophilus, a forest-haunting Bee-Eater. Mr. Swainson's name must merge in ours.



Conostoma Omodius $\frac{1}{2}$ Nat. Size

Foot and Bill full size.

Ballin & Co. lith.

and its natural position would seem to be between *Glaucopis* and *Cypsirinæ*. In manners the present species is a shy forester, adhering to the wilds, and tenanting the skirts of forests, where brush-wood as well as trees abound. Five or six birds are usually found together, chattering, hopping, and scraping on the ground, and resorting to the trees and shrubs chiefly for shelter. Their food is principally insects of the soft and imperfect kind in summer: but in winter they doubtless take some vegetable food. Their essential form may be characterised thus:—

Bill short, strong, conico-compressed, with broad rounded ridges and vertical sides; the culmen and commissure entirely arched, the tips equal, obtuse, and entire. Nostrils circular, unfossed, furnished with a membranous raised edge all round, and concealed by incumbent setaceous plumuli. Rictus provided with a close series of short bristles. Wings short, feeble, almost entirely rounded, the 6th, 7th, and 8th quills usually equal and longest. Tail slightly elongated, rounded, consisting of 12 broad simple plumes. Feet very large and strong, yet not typically ambulatory. Tarsi elevate, nearly or quite smooth, exceeding much the central toe and nail. Toes medial, unequal; fores basally connected, and outer lateral considerably longer than the inner. Hind toe large, depressed, exceeding the outer fore, and with its large nail reaching to the middle of the central toe and nail. Nails simple, large, scarcely so acute or so curved as in *Crypsirinæ*.

Habitat, the northern region close to the perpetual snows.

Type. *Conostama Œmodius*, Nob. new.

Specific character.

Conostoma with head, neck, and body above dull olive brown, clearest on the secondary alars—below, paler, and passing into sordid slaty blue, which forms, everywhere, the interior colour of the plumage. Iris brownish. Bill dull orange. Legs slaty grey. Sexes alike. Bill to tail $11\frac{1}{2}$ inches: bill $\frac{7}{8}$: tail $4\frac{7}{8}$: tarsus $1\frac{11}{16}$. Central toe and nail $1\frac{4}{16}$. Hind toe and nail $1\frac{2}{16}$. Weight $3\frac{1}{4}$ oz.

Catmandoo, August, 1841.

*A Monograph of the species of Wild Sheep.** By EDWARD BLYTH,
Curator to the Asiatic Society of Bengal.

The arrival of various spoils of different species of wild Sheep, since my memoir upon this genus of animals was read before the (Zoological) Society, enables me now to clear up several points which I formerly left as doubtful, as well as to include some additional species in the catalogue, and to indicate still others as probably distinct, and therefore desiderata to which the attention of travellers and others should be directed.

1. *Ovis Polii*, nobis, (the Pamir Sheep.) In the narrative of the celebrated Venetian traveller, Marco Polo, we read (in Marsden's edition, p. 142,) that upon the elevated plain of Pamir, eastward of Bokhara, and which is 16,000 feet above the sea level, "wild animals are met with in great numbers, particularly Sheep of a large size, having horns three, four, and even six palms in length. The shepherds form ladles and vessels of them for holding their victuals. They also construct fences for enclosing their cattle, and securing them against the Wolves, with which they say the country is infested, and which likewise destroy many of these wild Sheep or Goats" (*Moutoni v. Becchi* or 'Boucs.') More recently, an animal called the *Rasse* was indicated, from report, in Sir Alexander Burnes's Travels in Bokhara, (vol. ii. p. 208), and its horns have since been transmitted to the Royal Asiatic Society, by Lieut. Wood, of Sir A. Burnes's party, through the medium of G. T. Vigne, Esq.† In this magnificent specimen of

* This memoir upon the species of wild Sheep, read before the Zoological Society in July, 1840, has already been reprinted, with copious annotations bringing the subject up to my then state of knowledge, in Taylor's Magazine of Natural History, for May and June, 1841, and upon my arrival in India I found it again in type, and have availed myself of the opportunity to communicate some additional information.—E. B.

† Burnes "was told that the *Rasse* is larger than a Cow, but less than a Horse, of a white colour, with pendent hair under the chin," and a portion of skin attached to the occiput of the frontlet in London is covered with white hairs. "The flesh," he continues, "is much prized by the Kirghizes, who hunt and shoot the animal with arrows. It is said to delight in the coldest climates, and a common-sized specimen will require two horses to bear its flesh from the field. This creature is called *Rasse* by the Kirghizes, and *Kooshgar* by the inhabitants of the low countries." Lieut. Wood, however, (in the Narrative of his late Journey to the Source of the Oxus, p. 368,) distinguishes between the "*Rass* and *Kutchgar*, the former having straight spiral horns, and its dun colour being of a reddish tinge." It appears to me that three different animals

a frontlet, I incline to recognize (though not without hesitation) the *Ovis sculptorum*, formerly described by me from a horn in the Museum of the (London) Royal College of Surgeons, but as the characters of that specimen, as I originally drew them up, have not

are referred to under these names, two of which are confounded together by the latter author.

The *Kooch-i-Koh* of Sir Alexander Burnes' drawings now before me, refers to my *Ovis Vignei*, and the same, I am enabled to state positively, is the "*Kutchgar*" of Lieut. Wood, being also the "*Koch*" of the Sulimani range between India and Afghanistan. I shall quote Lieut. Wood's description of it under the head of *O. Vignei*; although this gentleman possessed the horns of both the *Ovis Polii* and *O. Vignei*; he does not appear to have distinguished them, but probably considered the latter to be the same species with the other, having horns incompletely developed. "A skeleton of this animal," he observes, "and several complete crania, were deposited, I believe, at Loodiana," and the crania here alluded to, five in number, together with some loose horns, are at present before me, and pertain to *Ovis Vignei*. Lieut. Wood confirms the statement of Marco Polo, mentioning, that "we saw numbers of horns strewed about in every direction, the spoils of the Kirghiz hunter. Some of these (being probably those of *O. Polii*) were of astonishingly large size. * * * The ends of these horns, projecting above the snow, often indicated the direction of the road, and wherever they were heaped up in large quantities, there our escort recognised the site of a Kirghiz summer encampment." This was at 14,400 feet above sea level. It is curious, (though by no means a recent discovery,) that the Kirghizes shoe their Horses with, and make stirrups from, the horns of these wild Sheep. "The shoes are nothing more than a semi-circular piece of horn placed on the fore part of the hoof. When the Horse is in constant work, it requires renewal at least once a week."

The noble frontlet of *Ovis Polii* in the Museum of the London Royal Asiatic Society was labelled "*Rass*, or *Roosh*," but it obviously cannot be the "*Rass*" stated by Lieut. Wood to have "straight spiral horns," and of which "the dun colour has a reddish tinge;" this refers, in the opinion of my friend Mr. Vigne, to the *Markbur* of Kabul, or *Rawacki* of Little Tibet, a race of very large feral Goats allied to the domestic animal, which is figured by Sir Alexander Burnes under the name of *Markhor*, (the locality not being specified,) and of which a skull and pair of loose horns have been transmitted to the Asiatic Society from Loodiana, together with the before-mentioned specimens collected by Sir Alexander Burnes. The *Markbur*, as I was informed by Mr. Vigne, inhabits also the hills of Budukshan; and I may observe, that its massive horns vary much in amount of spiral flexure, from the tense spirature of those of the Caffrarian Impoof, (*Boselaphus Oreas*), or straight with a prominent ridge wound round them, to the corkscrew curvature of the horns of the Koodoo, (*Strepsiceros Koodoo*), which is their most usual form, though sometimes they describe a still more open spiral than in that animal, more as in the Addax, (*Oryx Addax*), or at least such specimens of the latter as have come under my inspection.

To recapitulate, I think it probable, firstly, that the *Rass* or *Roosh* of Pamir will prove to refer properly to the *Ovis Polii*, and may mention that the appellation *Rasse* is likewise bestowed in Java upon a small species of Civet, (the *Viverra Rasse*, Horsfield, or *V. Indica*, Is. Geoff, but not the *V. Indica* of British authors;) 2ndly, that the *Kooshgar*, *Kutchgar*, *Kooch-i-Koh*, or *Koch*, applies exclusively to *O. Vignei*, which is also the *Shá* of Little Tibet, but

hitherto been published; as its flexure, too, which suggested the appellation of *sculptorum*, would appear to form a less extended spiral than is perhaps normal, and the habitat of our present subject also proves to be different from that rather suspected with instance of the other, (namely, the Taurus,) I here propose to dedicate the present gigantic animal to the illustrious Venetian traveller of the thirteenth century by the name of *Ovis Polii*.

As compared with the Rocky Mountain Sheep of North America, the *Rass* or *Roosh* of Pamir differs in having the horns considerably less massive, but more prolonged, approaching more in character to those of the domestic *O. Aries*, but differing again from the latter, not only in their very superior size, but in having their two front angles about equally developed. As in the Rocky Mountain species, and I believe also the *O. Aries* normally, the pair at first diverge backward, descending to gyre round at a parallel with the axis of the body, and inclining, as they again spire backwards, more outward to the tip. The horns described were in their seventh year of growth, and measure 4 feet 8 inches in length, following the curvature, and $14\frac{1}{4}$ inches round at base, having the tips, which are continued round till they point obliquely backwards, 45 inches apart. The width of their upper plane is $3\frac{1}{2}$ inches at base, $2\frac{3}{4}$ inches at the distance of one foot from the base, and $2\frac{1}{2}$ inches at two feet distance from the base; the depth of the base inside is 5 inches, and distance apart of the pair, measured outside, where they gyre forward at a parallel, 21 inches. The years of growth are successively $15\frac{1}{2}$, $10\frac{1}{2}$, 13, 8, 5, 3, and the last (incomplete) 1, inches. The College of Surgeons' specimen, a single horn, was in its eighth year of growth, but measures only 4 feet 4 inches round the curvature; its depth towards the base is 6 inches, and greatest width, about the middle, $2\frac{3}{4}$ inches. The successive annual growths are $12\frac{1}{2}$, 9, 8, 8, 7, 5, $3\frac{1}{2}$, and the incipient eighth, 1 inch. It is curved in a spiral involution, and scarcely outwards for three-fifths of a circle, when it gradually inclines more so to the tip, the horn describing one circle and about a

not the *Snd* of Great Tibet, the latter being the *O. Nahoor*; and 3rdly, that Lieut. Wood's "*Rass*" refers to the *Markbur*, while the true *Rasse*, (*Ovis Polii*,) the horns of which were transmitted by him to London, does not appear to have been distinguished by him from the species which he rightly describes under the denomination *Kutchgar*.—E. B.

a third. When upon the head, it must accordingly have gyred considerably inward, instead of descending at a parallel with the other, as indeed is almost invariably the case with the domestic *O. Aries*. Both specimens are of a pale colour, and indented with rugged transverse striæ, in general half an inch apart. Considering, indeed, the differences of the two specimens, it is by no means improbable that they will prove to be of allied rather than of the same species, in which case my former name of *O. Sculptorum* might be retained for that to which it was applied.

2, 3, and 4.—The Museums of Western Europe do not, that I can learn, contain any portion of the Siberian Argali, *Ovis Ammon* of Pallas, that might serve for comparison with the Rocky Mountain Sheep of North America, *O. montana* of Desmarest; but as the Kamtschatka Argali is described as a distinct species, *O. nivicola*, by M. Eschscholtz, in his *Zoologischer Atlas*, (differing from the two preceding in its inferior size, and in wanting, it would appear, the pale disk surrounding the tail, so conspicuous in both the others,) the probability is thus enhanced, that the Siberian and Rocky Mountain species are not the same, however closely they may resemble. The descriptions of *O. Ammon* would seem to apply in every particular to the *O. montana*, though it is still probable that actual comparison of specimens would lead to the detection of some discrepancies, as generally, but not always, happens in like cases. I may notice, that while Mr. Drummond affirms that the horns of old rams of *O. montana* “attain a size so enormous, and curve so much forwards and downwards, that they effectually prevent the animal from feeding on level ground,” the same had previously been remarked by Strahlenberg of the *Argalis* of Siberia, and no doubt is equally observable in the *Rasse* of Pamîr. The finest specimen of a head of the Rocky Mountain animal, of seven heads of adult males examined, is in the collection of this (the Zoological) Society, and gives the following admeasurements; horns 3 feet 5 inches over the front ridge, and $17\frac{1}{4}$ inches round at base, where the front angles are $4\frac{3}{4}$ inches apart. They number nine years of growth, which successively give 9, $7\frac{1}{2}$, $6\frac{1}{2}$, 5, $4\frac{1}{2}$, 4, $2\frac{1}{2}$, $1\frac{1}{4}$, and 1 inches. They are nearly equilaterally triangular, but bulge a little between the angles, having the inner or front angle obtusely prominent, the posterior

double, or forming a second plane at a slight angle with the superior one, and the inferior angle (if such it can be called) much rounded off: the greatest depth of the horn is about 6 inches; from base of front angle to tip they measure 11 inches; and the tips apart 26 inches. They are everywhere strongly furrowed across, more particularly in front, the intervals between the grooves swelling out considerably; and they gradually become, as in all the rest of the genus, more compressed to the extremity.

Of the *O. nivicola* of M. Eschscholtz, that naturalist writes: "The specimen described is a male in winter garb, measuring 5 feet (French?) in total length, and 2 feet 5 inches high. Its outer coat is of a yellowish-grey colour, brighter on the under parts, and inclining to straw-yellow on the head and neck; the markings in front of the limbs are of a rust colour; horns equilaterally triangular, 3 inches thick at base, and gyring outwards to form one complete spiral circle, 10 inches in diameter, and having their points directed outwards and forwards; the upper and posterior portions of the horn are level, and marked with deep annual indentations, which successively measure 7, 6, 5, 4, 3, 2, 2, and $1\frac{1}{2}$ inches, making eight years of total growth, besides which, there are numerous minor indentations or ordinary cross striæ, but no protuberant intervals." From the figure they would seem not to bulge between the angles, as is usual, though not invariably the case, with the Rocky Mountain species; as also to be somewhat more tensely spiral, as if pulled a little outward. The appearance both described and figured at the base of the fore-limbs externally, I suspect to be nothing more than the *axilla*, that had been twisted outwards in the mounting of the specimen. M. Eschscholtz describes this animal to be very numerous on the mountains of Kamtschatka, residing upon the snow-clad heights in summer, and descending to the lower regions in winter. A notice of its Chamois-like agility occurs in the Narrative of Kotzebue's Voyage from 1823 to 1826.

In the 18th volume of the Asiatic Researches, (part ii,) Mr. Hodgson, of Nepâl, gives a figure of a horned female of the Nahoor Sheep, and also of the skull and horns of a young Ram, which he erroneously refers to that species as since described by him. He also mentions having once possessed a pair of the horns, which he "could only lift

from the ground with a considerable effort ;" but it is necessary to observe, that the description which he gives in the volume adverted to, of the mutilated skin of a young wild Ram, procured in mid-winter, refers evidently to the Nahoor, and not to the species with horns having a triangular section, which is the subject of the present notice. According to Mr. Hodgson, the horns of this young specimen are "equilaterally triangular," as the figure likewise represents ; whereas the Rocky Mountain species would at the same age have much compressed horns, far from attaining to an equilateral triangle. Should a true species be here indicated, as is not improbable, distinct from *O. Ammon*, I propose that it be dedicated to that assiduous investigator of Nepalese Zoology, and be accordingly termed *O. Hodgsonii*.*

* This animal has since been more elaborately described and figured by Mr. Hodgson, under the appellation *Ovis Ammonoides*, (*vide* "Journal," ante, p. 230,) but except that no notice is taken of the pale disk surrounding the tail, as in the true Stags, which is a very conspicuous feature in the Argalis of Siberia and North America, and that the ears and tail would appear to be rather longer at least than my notes specify of the Rocky Mountain animal, (for, unfortunately, I have not Pallas's *Spicilegia* now to refer to, for the very complete description of *O. Ammon* furnished by that able naturalist,) I cannot perceive in what Mr. Hodgson's alleged species differs from the latter, and very much incline to the opinion that it will prove to be no other. The *O. Ammon* is described to be common in the Mongolian, Songarian, and Tartarian solitudes, inhabiting chiefly the lower ranges of the mountains, and it may be that Mr. Hodgson's specimens are trans-Himalayan, and were perhaps brought from a very considerable distance to the North-eastward. I mean to supply, however, some representations of (atleast) the Rocky Mountain animal, which, together with the following description, will probably enable Mr. Hodgson to arrive at a more decided opinion on the subject.

The Argali of either continent approaches the European Stag in the size of its body, but is lower on the legs ; having a pale disk, as large as in the Wapiti, surrounding its very short tail ; and truly enormous horns (as described in the text,) attaining to a circumference of sometimes more than $1\frac{1}{2}$ foot at base, with a length of 4 feet over the spire. (The American pair to be figured is the same as that described in the text.) Its colour is pale greyish fawn, or light chocolate-brown in younger individuals which have their coat newly renovated ; with the generic dark markings on the face, chest, and front of the limbs, more or less developed : there is a ridge of lengthened hair on the back of its neck ; and the chaffron of the male becomes excessively bombed with age, contrary to what has been asserted.

A recent American specimen, with horns $3\frac{1}{2}$ feet long, measured 6 feet from nose to tail, and was 3 feet 8 inches high at the back ; from nose to base of horns $9\frac{1}{2}$ inches, ears $4\frac{1}{2}$ inches, and tail 4 inches. A large Asiatic Argali, with horns 4 feet (Russian) in length, and one of which weighed 16 Russian or 15 English pounds, was $6\frac{1}{2}$ feet (English measure,) from nose to base of tail, and weighed 310 medical pounds ; the female is a third smaller, and a fine Asiatic individual weighed 209 $\frac{1}{2}$ medical pounds. The horns of a large American male have already been described, and

5. *O. Californiana*, Douglas.—The Jesuit Missionary, Venegos, observed in California “a kind of wild Sheep, the size of a calf of one or two years old, with extraordinarily thick horns, resembling those of a common Ram, and *tail shorter than that of a Stag*,”

those of the female, (as plainly appears from Pallas's figure of this sex,) though proportionately diminutive, become somewhat bulky towards the base in full grown specimens, assuming thus a corresponding character to those of the male.

The coat of the (American) Argali, observes Dr. Richardson, “like that of the Rein Deer, is, on its first growth in the autumn, short, fine, and flexible,” *i. e.* when the future tips of the hairs are alone put forth; “but, as the winter advances, it becomes coarser, dry, and brittle, though at the same time it feels soft to the touch. At the latter season the hair is so close at its roots that it is necessarily erect. Its colour is pale umbre or wood-brown, except on the buttocks and posterior part of the belly, which are whitish; a deeper and more shining brown prevails on the anterior aspect of the legs,” the chest, fore-neck, and face; “the short tail is dark brown, and a narrow brown line, extending from its base, runs up through the white disk to unite with the colour of the back. As the ends of the hairs (in which the colour resides) are gradually rubbed off during the progress of the winter, the tints become paler, and the old rams are thus almost white in the spring.” At this latter season, analogy indicates that the Argali again changes its coat, to assume a distinct summer garb, which (if I remember rightly) is described by Professor Pallas. According to this naturalist, an Asiatic lamb, of about three months old, and weighing 84 medical pounds, measured 3 feet from nose to tail, and $2\frac{1}{2}$ feet high: it much resembled a young kid, except in shewing a large flat protuberance at the place of each horn, and was covered with frizzled woolly hair of a dark grey colour, and which, on some parts, was 4 or 5 inches long.

Like all the domestic breeds of Sheep, when left at liberty to follow their own inclinations, it has been observed that the Asiatic Argali purges itself in the spring with *Ranunculaceæ* and other acrid plants, until vegetation of a milder kind begins to spring up, and shrubs to sprout, which, with alpine plants, constitute its ordinary food. It frequents the salt-marshes which abound in Siberia, and licks up the salt efflorescence diffused over the ground; and the American animal is described by Dr. Richardson to pay daily visits to certain caves in the mountains, situate in slaty rocks, that are encrusted with a saline efflorescence of which they are fond.

Upon the Rocky Mountains of North America, the Argali, according to Dr. Richardson, “frequents elevated and craggy ridges, and collects in flocks consisting of from three to thirty, the young rams and the females herding together during the winter and spring, while the old rams form separate flocks, except during the month of September, which is their rutting season. The ewes bring forth in June or July, and then retire to the most inaccessible heights. Their favorite feeding-places are grassy knolls, skirted by craggy rocks, to which they can retreat when pursued by Dogs or Wolves. Mr. Drummond informed me, that in the retired parts of the mountains, where the hunters had seldom penetrated, he found no difficulty in approaching the flocks of this species, which there exhibited that simplicity of character so remarkable in the domestic breeds; but where they had been fired at, they were exceedingly wild, alarmed their companions at the approach of danger by a hissing noise, and scaled the rocks with a speed and agility that baffled pursuit.”

whence it would appear that the Rocky Mountain species, or a near ally, is here alluded to. Mr. Douglas describes the Californian Argali to have a tail 18 inches long (vide Zoological Journal, vol. iv. p. 332.) Its length, he observes, from nose to base of tail,

In Asia, the Argali is described by Pallas to affect the bare rocks, upon which it is constantly found basking in the sunshine; preferring a temperate climate, though its range extends northward to a very severe one. No animal is more shy, and it gradually abandons a country in proportion as it becomes peopled. It is almost impossible to overtake it upon the ground which it chiefly frequents, as it retreats upon the least alarm in the direction of the most inaccessible crags, scrambling up and over the rocks with surprising agility, but ever and anon stopping to gaze at its pursuers, and successively veering from side to side as it runs, in the same manner as the domestic animal. The adults are quite untameable, but the lamb becomes perfectly domesticated if taken young. In autumn, when these animals descend from the mountains, they are fat and in high condition, but in spring they are very lean, for want of choice food, when they return to the sunny glens of the high mountains. Their lambs, one or two in number, are born before the melting of the snow; and the males butt at each other for the possession of the females in precisely the same manner as the domestic ram.

The flesh of the Argali is pronounced by all who have tasted it, when in season, to be equal, if not superior, in flavour to the finest English mutton; and the same is remarked of other wild species of this genus; though, when out of season, they would appear to be tough and of rank flavour, on which principle may be reconciled a variety of conflicting testimonies.

The Argali formerly inhabited the country about the river Irktisch, as well as other parts of Siberia, where it is now no longer met with, since colonies have been planted in those dreary regions: at present it is chiefly known to abound in the territory to the eastward of Lake Baikal, extending northward on the banks of the Lena to lat. 60°. Its identification to the southward, upon the eastern Himalayas, and consequent presumed diffusion over the intervening mountain ranges, between the great sandy deserts on the west and the frontiers of China, is therefore not improbable. In America, its most closely allied representative, if it be not the very same species, is confined to the western side of the Rocky Mountains, as in Asia it inhabits the opposite eastern region; being found, according to Dr. Richardson, upon the lofty chain of the Rocky Mountains, inhabiting from its northern termination in lat. 68° to about lat. 40°, and most likely still further south. They also frequent the elevated and craggy ridges with which the country between the great mountain ridge and the Pacific is intersected; but they do not appear to have advanced further to the eastward than the Rocky Mountains, nor are they found in any of the hilly tracts nearer to Hudson's Bay. (*Fauna Americana-borealis*.) More recently, the same naturalist writes (in the Zoological Appendix to Capt. Beechy's Voyage)—“This species inhabits the timbered parts of the Rocky Mountains, and the hilly countries between that range and the Pacific, from North California to the 62d parallel.” He there expresses his opinion that the Kamtschatka species, as described by Eschscholtz, “appears distinct;” and it may be that the two are found together in the territories of the Tungusi, as the Californian species would appear to coexist with the ordinary American Argali in the regions adjacent to the Columbia river: these latter are doubtless frequently confounded together.—E. B.

is five feet 10 inches; height of the shoulders 2 feet 8 inches; girth behind the shoulders 6 feet; head 16 inches long, 7 [to] between the eyes, and 9 [to] between the horns; ears erect, $1\frac{1}{2}$ inch [$4\frac{1}{2}$ inches?] long, obtuse. The horns deposited in the Museum of this (the Zoological) Society, bear a general resemblance to those of the Rocky Mountain species, but are smoother, and form a much more open spiral: the terminal third is very much compressed, the medial intermediate, and the basal very thick and triangular: they were only in their fifth year of growth, and would doubtless have attained to much greater dimensions. Their length is 32 inches, measured over the front-ridge, and girth at base $14\frac{1}{2}$ inches, having a span of $12\frac{1}{2}$ inches from base to tip inside: from the tip to first annual depression they measure $12\frac{1}{2}$ inches, and then successively $6\frac{1}{4}$, $5\frac{1}{2}$, $4\frac{3}{4}$, and the incipient fifth year's growth 2 inches. They do not bulge between the angles, which are rather obtuse, and, as usual, are transversely striated. Approximate distance of the tips apart 33 inches.

"From the testimony of the Indian tribes about the Great Falls of the Columbia River," writes Mr. Douglas, "this species appears to inhabit the subalpine regions of Mount's Wood, St. Helen's, and Vancouver, but is more numerous in the mountainous districts of the interior of California. The only good skin that ever came under my observation was in lat. $46^{\circ} 14' 55''$, and long. $121^{\circ} 17' 0''$. Forbes, in his recent work on California, appears to allude to it by the name of *Be-rindo*, which in Mexico is applied to the *Antilocapra furcifera*.* He quotes, however, the description by Venegos, including the statement that it has a short tail, and remarks, that "they still abound in the plains at the foot of the mountains, and are always found in large herds." It does not, from the context, appear to me that the pronghorned animal is intended.

* In reference to the name which is here employed, Colonel Hamilton Smith has stated, in one of his letters to me, "that when I first shewed my drawings and description of this animal in Paris, it was totally unknown, and my account was disbelieved; Geoffroy St. Hilaire telling me 'vous permettez qu'on doute.' That description, with the drawing, was then already before the Linnæan Society, and after twenty months, when Mr. Ord's account had come out, they at length published mine," &c. This animal is the *Dicranoceros* of Colonel Smith, *Antilocapra* of Ord, and *Mazama* of Ogilby.—E. B.

From these we might proceed, through the domestic *Aries*, to the species generally typified by the *Mouflon* of Corsica ; but I shall interpolate a small group from the Himalaya, and apparently Caucasus, distinguished by having smooth and sub-cylindrical horns, that form a bold arc outwards at nearly right angles with the axis of the body, and have the tip turned backward. Such is .

6. *O. Nahoor*, Hodgson.—The Nahoor or *Nervati*, and *Snà* (not *Shà*) of Tibet. Size of the larger breeds of tame Sheep, with pale horns; and general colour dull brownish grey in old animals, with the ordinary dark markings on the face, breast, and limbs, more or less developed. Younger specimens, more particularly, have their coat, when renovated, tipped with a light fulvous tint, deeper along the middle of the back ; the tail is bushy, and conspicuously white, its medial portion generally dark. Length, as given by Mr. Hodgson, 4 feet from nose to base of tail, and height of the back 32 inches. A female was 3 feet 4 inches from nose to tail, and stood 29 inches high at the shoulder. From nose to between the horns a male measured $8\frac{1}{2}$ inches ; the ears $4\frac{1}{2}$ inches ; and tail 4 inches, or 7 inches to the end of the hair. A pair of horns in the Museum of this Society, which are far from having attained their full growth, measure 12 inches in circumference at base, and $20\frac{1}{2}$ inches long over the curvature, having their tips 27 inches asunder : their successive annual growths were respectively $6\frac{1}{2}$, 4, 3, $2\frac{3}{4}$, $2\frac{1}{2}$, and $1\frac{3}{4}$ inches.* Those of a very old female in the British Museum, have precisely the same curvature as in the male, only that the tips do not turn so much backwards ; they are, however, much compressed, and measure $9\frac{3}{4}$ inches long, $4\frac{1}{2}$ inches round, with the tips 14 inches apart. Another female, in the collection of this (the Zoological) Society, is entirely destitute of horns. The latter, and a young male which I formerly examined at Mr. Leadbeater's, accorded perfectly with the description by Mr. Hodgson, having pale slaty blue hairs, deeper on the back, and tipped with a rufous tint, more particularly on the back, which caused

* A handsome frontlet now before me, whereof the horns are in their tenth year of growth, gives the following admeasurements. Horns $24\frac{1}{2}$ inches long over the curvature, and $11\frac{1}{2}$ inches round at base, with the reverted tips 26 inches asunder. In another, but 7 years old, the horns measure $12\frac{1}{2}$ inches round at base, with a length of $23\frac{1}{2}$ inches. The annual growths of the former are successively $8\frac{1}{4}$, $2\frac{3}{4}$, $2\frac{1}{4}$, 2, $1\frac{1}{2}$, $1\frac{1}{4}$, $1\frac{1}{4}$ and 1 inches.—E. B.

the animal to appear of a pale fulvous or isabelline hue. An old male in the Museum of the Linnæan Society,* and the aged female in the British Museum, together with another skin which I have seen, have not only no trace of this colour in their present state of *pelage*, but I doubt whether they shewed much of it when their coat was new: the colour of all three is a dingy grey-brown, not easy to express in words.

The horns of the Nahoor differ but little in flexure from those of the next species, but may nevertheless be distinguished by many differences, in general strongly pronounced; as their superior size; the greater proportional thickness of the basal half, beyond which they narrow somewhat abruptly; the flatness of their dorsal aspect, with a much more acutely raised ridge along its middle; and by the comparative sharpness of all the angles, together with the existence, generally, of some traces of cross-striæ, more particularly towards their compressed tips; whereas the horns of the Burrhel Sheep are much less angular, of a deep rufous-brown colour, and quite smooth. Those of the female Nahoor described were entirely destitute of cross-furrows; but all have the marks of annual growth conspicuously indented.

This species, according to Mr. Hodgson, "inhabits the Kachâr region of Nepal, northward of the habitat of the Jharal Goat, amid the glaciers of the Himalaya, and both on the Indian and Tibetan sides of that range." Mr. Vigne informs me, that it is plentiful in Great but not in Little Tibet. I suspect that it is never found at so considerable an altitude as the next species.

7. *O. Burrhel*, nobis.—Smaller and more robust than the Nahoor, with shorter ears, and very dark horns; having no white upon it; and general colour dark and rich chestnut-brown, or mahogany, with the ordinary black markings upon the face, chest, and front of the limbs, very distinct; tail apparently minute.

This handsome species bears pretty much the same relationship in appearance to the Nahoor, which the English breed of South Down domestic Sheep bears to the Leicester breed, except that there is

* Mistaken for *Ovis Ammon* in the *Fauna Americana Borealis*, vol. i. p. 274, nap for a second specimen of *O. Burrhel* in part 6, p. 79, for July 10, 1838, of the Proceedings of the Zoological Society.—E. B.

not so much difference in size. Length, of the unique stuffed specimen in the Museum of this (the Zoological) Society, from nose to tail, 54 inches, but a foot less would probably give the dimensions of the recent animal, as the skin is evidently much stretched; height of the back 32 inches, from which also about 2 inches might be deducted; from muzzle to base of horn 8 inches, and ears $3\frac{1}{2}$ inches. The horns measure 20 inches over the uppermost ridge, and 10 round at base, having their tips 25 inches apart; but those of a specimen noticed in the Bengal Sporting Magazine, (for 1839, p. 295,) were $25\frac{1}{2}$ inches long, with a girth of $11\frac{1}{2}$ inches; and a horn of this same species, which I examined at Mr. Leadbeater's, had attained a length of 2 feet, and circumference of 11 inches at base, having a span of 14 inches from base to tip inside, and numbering at least ten indications of annual growth, and probably at least one more towards the tip, which could not be made out with certainty. The respective lengths of these were successively $10\frac{1}{2}$, $2\frac{1}{2}$, $2\frac{1}{4}$, $1\frac{3}{4}$, $1\frac{3}{4}$, $1\frac{1}{2}$, 1, 1, $\frac{3}{4}$, and the basal $\frac{1}{2}$ inches. The coat of the Burrhel Sheep is rather long, and harsher than that of the Nahoor, having less wool concealed beneath it than in the Moufflon and Rocky Mountain species. The female is undescribed, and I have met with no other specimens than are here mentioned.

In the description of the preceding species, the principal differences are stated which distinguish the horns of that animal from those of the present one. The Burrhel's horns have all the ridges rounded off, though still sufficiently distinct, and the marks of annual growth are deeply indented, the horn bulging a little between them. Upon a front view the backward curvature of the tips disappears altogether, and the animal has an imposing appearance, finer than that of the Nahoor. Its colour is much darker than the summer dress of the Moufflon Sheep.

The Burrhel would seem to inhabit a much loftier region of the Himalaya than the Nahoor, where it bounds lightly over the encrusted snow, at an altitude where its human pursuers find it difficult to breathe. It has the bleat of the domestic species, as indeed they all have, and is very shy and difficult of approach. Flocks of from ten to twenty have been observed, conducted by an old male, which make for the snowy peaks upon alarm, while their leader scrambles up some crag to reconnoitre, and if shot at and missed, bounds off a few paces fur-

ther, and again stops to gaze. They pasture in the deep hollows and grassy glens. The Society's specimen was met with near the Boorendo Pass, at an altitude estimated to have been from 15,000 to 17,000 feet. The notice in the 'Bengal Sporting Magazine' refers to the same locality; and another notice most probably alludes to this species, in Lieut. Hutton's 'Journal of a Trip through Kunawar,' published in the 'Journal of the Bengal Asiatic Society' for 1839, p. 994.* Finally, Mr. Leadbeater informed me, that the horn described as having been in his possession was brought from Nepál, together with specimens of the Nahoor and Musk, and the skull and horns of a Himalayan Ibex, which I also examined.

8. *O. Cylicornis*, nobis, (the Caucasian Argali.)—Colonel Hamilton Smith notices this animal in his description of *O. Ammon*, (published in Griffith's English edition of the "*Regne Animal*," vol. iv. p. 317,) and writes me word, that an individual died on landing it at Toulon, whither it had been brought by a French Consul, who did not preserve the skull or skin, but set up the horns, which were quite fresh when he saw them. "Each horn was about 3 feet long, arcuated, round, as thick at the top as at the base, of a brown colour, nearly smooth, and about 15 inches in circumference. They were so heavy and unmanageable," writes Colonel Smith, "that I could not lift both together from the ground, nor place them in that kind of juxta-position, which would have given me an idea of their appearance on the head. I could not well determine which was the right, or which the left horn. Circumstances prevented my taking a second view of them, as they arrived only the day before I left Paris, and they are now doubtless in the Musuem of that capital." In my former paper I alluded to this animal as probably distinct, and apparently allied to the Burrhel: the foregoing details confirm me in that opinion, and remove all doubt of its distinctness, as there is no other species to which they will at all apply. The sketch

* More recently, I perceive that Lieut. Hutton has identified the animal here referred to with *O. Nahoor* (vide 'Journal,' 1840, p. 568), but it is probable that both species are found there, and they cannot well be confounded after the description which I have given of *O. Burrhel*. Of the *Ovis Ammon*, Lieut. Hutton observes, "I could learn nothing, save that an animal apparently answering to the description is found in Chinese Tartary, and I saw an enormous pair of the horns nailed, among other kinds, to a tree as an offering to Devi." These, however, may have belonged to *O. Poli*.—E. B.

which Colonel Smith has favoured me with, represents a Sheep horn, apparently of the same general form as those of the Burrhel and Nahoor; but the dimensions specified are very superior to those attained in the instance of either of the two Himalayan species adverted to, and I can only suppose that the (reverted?) tips had been broken off, and the truncated extremity worn smooth. The wild Sheep of Caucasus and Taurus are at present little known, nor does any notice of this genus occur in the catalogue of Caucasian animals, published by M. Ménétries; though it is nevertheless certain, from the vague incidental notices of various travellers, that some, and not unlikely several, exist. At Azaz, by the foot of Taurus, Mr. Ainsworth mentions having seen an animal, which he designates *Ovis Ammon*, (vide Travels in Assyria, Babylonia, and Chaldea, p. 42.)*

9. *O. Gmelini*, nobis, (the Armenian Sheep.)—This species belongs to the Moufflon group, but is yet very different from the Moufflon Sheep of Corsica. It is described and rudely figured in the *Reise durch Russland* (vol. iii. p. 486, and Tab. LV.,) of the younger Gmelin; and the skull and horns, forwarded by that naturalist to St. Petersburg, have been figured and described by Pallas in his *Spicilegia* (Fasc. xii. p. 15, and Tab. V. fig. 1.) Messrs. Brandt and Ratzeburg erroneously identified it, at the suggestion of M. Lichtenstein, with the wild Cyprian species, the horns of which have a nearly similar flexure. Fine specimens of the male, female, and young, lately received by this Society from Erzeroom, enable me to give the following description:—

Size of an ordinary tame Sheep, with a remarkably short coat,† of a lively chestnut-fulvous colour, deepest upon the back; the limbs and under-parts whitish, with few traces of dark markings, except a finely contrasting black line of more lengthened hair down the front of the neck of the male only, widening to a large patch on the breast; and in both sexes a strip of somewhat lengthened mixed black and white hairs above the mid-joint of the fore-limbs anteriorly, which cor-

* Very probably, however, this notice refers to the next species, *O. Gmelini*; as may, also, that of Captain Mignan, who mentions seeing “flocks of mountain Sheep, the Chamois, and wild Goats,” at the foot of the Aligez range. Vide ‘Winter Journey to Koordistan,’ vol. i: p. 195.—E. B.

† Evidently the summer garb of the species.—E. B.

responds to the tuft of *O. Tragelaphus* ; tail small, and very slender : horns of the male subtrigonal, compressed, and very deep, with strongly marked angles and cross striæ, diverging backwards, with but a slight arcuation to near the tips, which incline inwards. As regards the flexure alone, but not the character of the horn, which is allied to that of the common Ram, this handsome species links the Moufflon group with the Nahoor and Burrhel group.

Length nearly 5 feet from nose to tail ; the tail 4 inches : from nose to base of horn 8 inches ; and ears $3\frac{1}{2}$ inches. Horns (about full grown, or nearly so,) 20 inches over the curvature, 10 round at base, 4 deep at base inside, their widest portion 2 feet apart, and tips 21 inches, with a span of $13\frac{1}{2}$ inches from base to tip inside ; their colour pale. Around the eye and muzzle this species is whitish ; the chaffron and front of the limbs are more or less tinged with dusky, and its coat is rather harsh, and fades considerably in brightness before it is shed. Female generally similar, but smaller, with no black down the front of the neck, and in the observed instances hornless. The lengthened black hair of the male is only 1 inch long, and that composing the tuft on the fore-limbs is so disposed that the latter is white in the centre, flanked with blackish.

According to M. Gmelin, this species is found only on the highest mountains of Persia. Its rutting season takes place in September, and lasts a month ; and the female yeans in March, producing two or three lambs at a time : the males, he informs us, are very quarrelsome amongst each other ; insomuch that he had been at one place where the ground was completely strewed with horns that had been knocked off in their contests ; so that if any variation in the flexure of these horns had been observable, this industrious naturalist would doubtless have remarked it. Sir John McNeill informed me, that "it appears to be the common species of the mountains of Armenia ; occurring likewise on the north-west of Persia." but the wild Sheep of the central parts of Persia is evidently distinct,* "having horns much more resembling those of the domestic Ram, being spiral, and completing more than one spiral circle—I think I am not mistaken in supposing," continues Sir John, "that I

* As also that of the eastern districts, which appears to be *O. Vignei*.—E. B.

have also had females of this species brought to me by the hunters, with small horns, resembling those of the ewes of some of our domestic Sheep; but, on reflection, I find that I cannot assert this positively, though I retain the general impression." It is highly probable, that a wild type of *O. Aries* is here adverted to, which would thus inhabit the same ranges of mountains as the wild common Goat, (*C. Ægagrus*): and with respect to the circumstance of horns in the female sex, I may here remark, that this character is very apt to be inconstant throughout the present group. It has already been noticed in the instance of *O. Nahoo*; and the elder Gmelin states that the females of *O. Ammon* are sometimes hornless, while those of the Corsican *O. Musimon* are generally so. The same likewise happens in different species of wild Goats, in the Goral of India, and in the prong-horned animal of North America; and even in the Gazelles, and other bovine-nosed species of what are commonly confused together under the name of Antelope, there have been instances of hornless males as well as females. A male Spring-bok of this description, as I am informed by Colonel Hamilton Smith, was long in the possession of the Empress Josephine; and the specimen of *Ixalus Probaton*, Ogilby, in the Museum of this Society doubtless affords another example of the same phenomenon.

10. *O. Vignei*, nobis: the *Shá* (not *Sná*) of Little Tibet, and *Koch* of the Sulimani range between India and Afghanistan.*—This fine species is closely allied to the Corsican Moufflon, but is much larger, with proportionally longer limbs, and a conspicuous fringe of lengthened blackish hair down the front of the neck, and not lying close, as in the Moufflon.† Its size, as I am informed by Mr. Vigne, is that of a large Fallow Deer, and "from the general appearance of these animals, their length of leg, and swiftness on the mountains, they reminded me," remarks that gentleman, "of Deer, rather than Sheep."

* Also the *Kutchgar* of Pamir, described by Lieut. Wood, and *Kooshgar* or *Kooch-i-Koh* of Sir Alexander Burnes; *Ovis cycloceros*, Hutton, ('Calcutta Journal of Natural History, No. IV. p. 557.')

† At least as in the Mufflon in summer dress, for in winter it also hangs loosely in this animal. I believe now, however, that the summer and winter coats of both species will be found to correspond in this particular.—E. B.

The general colour of this animal, to judge from an elaborately finished painting, taken from a living individual in its native country by Mr. Vigne, to whom we are indebted for all we know concerning the species, is a rufous brown, apparently not so deep as in the Moufflon; the face livid, or devoid of the rufous tinge of the body, and not terminated by a white muzzle, as in the Moufflon Sheep: the belly is white, separated by a black lateral band; and the limbs are brown, not mottled, as in the Moufflon, but with a whitish ring immediately above each hoof, then a dark ring, and above this a little white posteriorly, as in the Neelgai. The fringe in front of the neck is doubtless peculiar to the male, and the hairs of it would appear to be 4 or 5 inches long, and hang loosely. Tail about 6 inches long, and slender, apparently resembling that of the Armenian species rather than the Moufflon's.*

* This species has been described as the "Wild Sheep of the Paropamisan range," by Captain Hay, (in the 'Journal,' for 1840, p. 440,) and I have no doubt of the correctness of this identification, though certain discrepancies are deserving of being noticed. Capt. Hay states the muzzle to be white (as in the Corsican Moufflon); the legs, too, to be "covered with white, smooth, short hair; belly white; tail small, short, and together with the buttocks white. The general colour" he says, "is pale rufous inclining to grey, and fading off to white beneath. A large beard from the cheeks and under-jaw, divided into two lobes, which are white, and connected to a streak of long black flowing hair reaching to the chest. The adult male stands 3 feet 4 inches at shoulder: from nose to tail 5 feet 4 inches; head 1 foot; neck ponderous, 14 inches long, and 24 in circumference; girth of body, behind shoulders, 4 feet. The female is inferior in size, and not so much of a rufous colour; having small horns about 6 inches in length, which incline backwards and outwards. Those of the male are 2½ feet in length, and 12 inches round at base," &c. "The lambs are the colour of the female, have a dark stripe down the back, and in front of the fore-legs. They are produced in May and June."

Drawings of both sexes of this same species, transmitted by the late unfortunate Sir Alexander Burnes, are also before me, and present a somewhat different coloration from either of the above. The male is stated to have measured "4½ feet [5½ feet ?] in extreme length, from nose to tail-tip, and 3 feet 5 inches high, from the sole of the foot to the shoulders; female 3 feet 10 inches long, and 2 feet high." Both are evidently represented in summer dress, of an uniform light bay colour (including the limbs and tail), rather more vivid in the male, and merely fainter on the under-parts; there is no trace of lateral band; the face of the male only is coloured more livid, and with no white muzzle in either sex; nor is there any mottling near the hoofs (as in Mr. Vigne's drawing), but a slightly dark shade in front of the limbs of the male only, which, it may be, is intended merely for shadow. The lobes of hair pendent from the sides of the lower jaw are whitish, and the fringe down the front of the neck is coloured dusky-black, being not very long, and projecting so as to form an obtuse point or angle opposite the lower part of the neck, exactly as in the Moufflon of Corsica. The female has not

A full grown pair of horns measure $32\frac{1}{2}$ inches over the curvature, and 11 inches round at base; their widest portion apart, measured outside, is 2 feet, the tips converging to 8 inches, and span from base to tip also 8 inches: they are subtriangular, much compressed laterally, the anterior surface $2\frac{3}{4}$ inches broad at base, with its side-angles about equally developed, and the posterior part of the section tapers rather suddenly to a somewhat acute angle; eight years of growth are very perceptible, which successively give 12, 7, 4, 3, 3, $1\frac{1}{2}$, $1\frac{1}{2}$, and $\frac{1}{2}$ inches; they bear considerable resemblance to those of the Moufflon Sheep, but differ in being very much larger, and in the circumstance of the outer front-angle being as much developed as the inner one, and they have not the slightest tendency to spire, but describing three-fourths of a circle, and originally diverging as in a common Ram, they point towards the back of the neck, somewhat as in *O. Tragelaphus*. Another and younger specimen, however, has a decided spiral flexure outward, more especially towards the tip, and has also the outer angle much less developed than in the corresponding terminal portion of the former. This pair had grown to 11 inches long, with the tips $14\frac{1}{2}$ inches apart; only one year's growth, and that apparently incomplete, is however exhibited, and the curvature is likewise less than in the older specimen. The portion of skull attached is also so much smaller, that I think it prudent to hesitate in identifying it as specifically the same. The posterior margins of the orbits are but $4\frac{1}{2}$ inches apart, whereas in the other they are $5\frac{1}{2}$ inches. There are no materials for extending the comparison, but a few more dimensions may be given of the smaller one. The greatest width of this skull at the posterior portion of the zygomæ is 5 inches, and the orbits are $3\frac{1}{4}$ inches distant where most approximated: the series of 5 developed molars occupied $2\frac{3}{4}$ inches; width of second true molars apart, posteriorly and externally, $2\frac{1}{4}$ inches; of anterior false molars, measured outside and before, $1\frac{1}{8}$ inch;

any trace of this lengthened hair, and is represented with very short horns, indicating that the individual was probably young.

Mr. Vigne's coloured portrait represents a much younger male than that figured by Sir Alexander Burnes, and I should say in winter vesture: the same gentleman had also a coloured figure upon a large scale of the head of a still younger specimen, which was coloured similarly to the other, or of a livid hue, without any white muzzle. I possess copies of both figures.—E. B.

greatest width of palate, $1\frac{3}{4}$ inch, and from front or first false molar to anterior portion of occipital foramen, $5\frac{3}{4}$ inches. Mr. Vigne, indeed, assures me, that the adult has only five grinders on each side of both jaws, as in the Chirew, which, if normal, would make an important distinction, as the smaller specimen would undoubtedly have developed a third true molar, and possesses three false ones; whereas it is in one of the latter that the Chirew is deficient. I am inclined, however, to regard the two specimens as belonging to the same species, since I have observed analogous differences in the mere flexure of the horn in different Corsican Moufflons; but it was at all events proper to indicate the disparity.*

Vast numbers of this species," relates Mr. Vigne, "are driven down by the snow in winter to the branches of the Indus, near Astor, at the southern extremity of Little Tibet, where the river breaks through the chain of the Himalaya. I once saw a young one, apparently of this species, in Persia, but took no memorandum of it at the time; it was dirty and draggled, but, I think, was covered with short wool." I have great pleasure in dedicating this species to that gentleman.†

* Five skulls, with the horns, of adult males, are now before me, together with some loose horns, which enable me to decide that the above animals were the same in species; it is very rarely, however, that the outer front-angle of the horn does not quite equal the inner one; the extreme length of skull, from vertex to tip of intermaxillaries, is $8\frac{3}{4}$ inches, and greatest breadth $5\frac{1}{2}$ inches; length of bony palate $4\frac{3}{4}$ inches. The series of molars consists, as usual, of three true and as many false molars.—E. B.

† The *Ovis Vignei* is extensively diffused upon the various ramifications of the Hindoo Koosh, inhabiting Pamir on the north-east, the Sulimani chain of mountains on the south, and westward the ranges of the Elboorz, which skirt the southern extremity of the Caspian Sea. At least I judge this to be the species mentioned in Mr. Fraser's 'Winter Journey from Constantinople to Tehran,' (vol. i. pp. 153, 155, and 159,) as being very numerous upon a mountain near Shahrood. This traveller notices, "The wild mountain Sheep and Goats. The male of the former is a noble animal, with a curly neck, and mane that would become a Lion [winter coat?], and prodigious curling horns; the latter [probably *C. Ægagrus*] has immense horns curving backwards. These mountain Sheep and Goats, warned by their sense of smell, were making off from our vicinity, at more or less speed, to places where they might be secure; there they would stand still upon some point or slab of rock, resembling it so nearly in colour as scarcely to be distinguishable without a glass." Again, further to the eastward, "a noble mountain Sheep" is mentioned (at p. 399); and "The wild Sheep and the wild Goat" are stated by the Hon. Mount Stuart Elphinstone to be common on the eastern hills of Afghanistan.

In the latter country, Capt. Thos. Hutton has more recently observed the *O. Vignei*, and supposing it undescribed, proposes for it the provisional name *O.*

11. *O. Musimon*, Linnæus.—The Moufflon Sheep of Corsica and Sardinia, but not, there is reason to suspect, of the Levantine countries. It is unnecessary to give a detailed description of this beautiful little species, though I may mention that the fine living male in the gardens measures 39 inches from nose to tail; the tail 5 inches; from nose to base of horn 7 inches; ears 4 inches; neck, from posterior base of horn to the abrupt angle of its insertion, 8 inches, and thence to base of tail 21 inches; height at the shoulder $2\frac{1}{4}$ feet. The horns of this individual are remarkable for not spiring in the least degree, whence they point towards the back of the neck: they measure 21 inches over their curvature, and $8\frac{1}{4}$ inches round at base, being in their fifth year of growth; their widest portion apart is 15 inches, and at the tips 6 inches; but another pair, upon the stuffed specimen in the Museum,

cycloceros, “from the circular position of its horns.” (*Extract from a letter dated Candahar, 12th September, 1840, published in the Calcutta Journal of Natural History, No. iv. p. 557.*) This gentleman thinks it will prove to be the proper “Bearded Sheep” of Pennant, and there is little or no doubt he is right so far as regards the imperfect skin purchased by Pennant in Holland, and which that naturalist was informed “came from the East Indies;” but Pennant erroneously identified this skin to be of the same species as the Barbary animal, (*O. Tragelaphus*,) and mixes up the two in his description. The figure he refers to, also, as taken from the living animal in Paris, and of which a copy is given by Shaw, (if I mistake not, a little embellished about the cheeks and chin,) appears to me to represent a Corsican Moufflon, (*O. Musimon*,) the hoofs of which had grown out of a state of protracted confinement, as commonly enough happens with captive ruminants.

Compare Mr. Fraser’s notice with that of Lieut. Wood, of a specimen of the “*Kutchgar*” of Pamir: this author states, “It was a noble animal, standing as high as a two year’s old colt, with a venerable beard, and two splendid curling horns, which, with the head, were so heavy, as to require considerable exertion to lift them. Though in poor condition, the carcass, divested of its offal, was a load for a baggage pony; its flesh was tough and ill-tasted, but we were told that in autumn, when this animal is in prime condition, no venison is better flavoured. The *Kutchgar* is gregarious, congregating in herds of several hundreds. They are of a dun colour, the skin more resembling the hide of a cow than the fleece of a [tame] Sheep. A skeleton of this animal, and several complete crania, were deposited, I believe, at Loodiana.” The latter are now before me, or (as in a note to Taylor’s reprint of this memoir,) I should have been tempted to refer the foregoing notice to *O. Polii*. Whereas the carcass of *O. Vignei*, however, “divested of its offal, is a load for a baggage pony,” Sir Alexander Burnes was informed, respecting the “*Rasse*,” that “a common sized specimen will require two horses to bear its flesh from the field,” and the latter is moreover reported to be of a white colour. Capt. Hay remarks, that the present species is “gregarious in flocks of about forty, headed by an old male.” A stuffed specimen, I am told, exists in the Museum of Paris.—E. B.

which shew the more usual [?] slight spirature are 26 inches long, having their widest portion 14 inches apart, and the tips as much as 12 inches : this pair shews seven years of growth, and their development was evidently completed, though they are only 7 inches in girth at base. The female has seldom any horns, which, when they exist, are ordinarily about 2 inches long.

The character of the horn of the Moufflon is nearly the same as that of the domestic Ram, only that it is never so much prolonged, nor indeed to more than two-thirds of a circle : the inner front edge is acute to near the base, where the outer one approaches to an equality with it ; the first half being thus unequally triangular, and the remainder much compressed, with strongly marked rugæ, and having the inner surface of the horn concave. It has always appeared to me, however, that the specific distinctness of the Moufflon is very obvious, and I doubt whether it has contributed at all to the origin of any tame race. That it interbreeds freely with the latter, under circumstances of restraint, is well known ; but we have no information of hybrids, or *Umbri*, as they are called, being ever raised from wild Moufflons, though the flocks of the latter will occasionally graze in the same pasture with domestic Sheep, and all but mingle among them. The male of this animal is denominated in Corsica *Mufro*, and the female *Mufra*, from which Buffon, as is well known, formed the word 'Moufflon ;' and in Sardinia the male is called *Murvoni*, and the female *Murva*, though it is not unusual to hear the peasants style both indiscriminately *Mufion*, which, (as Mr. Smyth remarks in his description of that island,) is a palpable corruption of the Greek *Ophion*. It is sometimes stated, but I do not know upon what authority, that a few of these animals are still found upon the mountains of Murcia.*

* I am not aware that the winter dress of the Moufflon has ever been described. In summer the coat presents a smooth surface, with the hair in front of the neck but moderately elongated, and lying close, though projecting so as to produce an obtuse angular outline opposite the lower part of the neck, where it is longest. The general colour is bright rufous brown, with a triangular white saddle-like mark on each side ; the head is dusky, with a white muzzle, and darker chaffron ; the belly and limbs below the mid-joint are also white, with generally dark markings in front of the latter, more or less developed ; and there is a conspicuous white disk surrounding the tail, but not ascending above it (as in the Argali;) the lengthened hair in front of the neck is black, as also a lateral band bordering the white belly, together with the outside and inside of the upper half of the fourlimbs, the tail, and

12. The *Cyprian Moufflon*, figured and described by Messrs. Brandt and Ratzeburg from a specimen in the Berlin Museum, and contrasted by them with M. F. Cuvier's figure of the Corsican animal, is probably a distinct species, intermediate to *O. Musimon* and *O. Gmelini*; its

a median line over the forequarters terminating at the white saddle: the female is much less rufous, with the dark markings less developed, and no white patch on the sides.

In winter, there is a considerable admixture of black about the body; the hair upon the nape, and especially the withers, is much elongated, forming a very conspicuous mane when it does not fall over on one side; that on the under or forepart of the neck is also of considerable length, and projects forward in a peculiar manner, being directed upward from the chest, and downward from the upper portion of the fore-neck; but the most remarkable feature consists in what in summer merely forms the triangular white patch on the sides, which is then even with the rest of the coat, whereas in winter dress this forms a whorl of very much lengthened white hair protruding far beyond the rest, and imparting a singular appearance to the animal when viewed otherwise than laterally. I have observed the same character in a woolly domestic Sheep, which was brought from one of the West Indian islands, in which case the whorl of white hair projected beyond the rufous wool.

The Moufflon is a very brisk, energetic animal, rather powerfully made, and strong about the neck, but appearing more so from the length of the hair in front of that part, which in winter may be termed shaggy; the wool beneath its hair is much more copious than in the wild Sheep generally. Its pace is a fleet canter, all lightness and agility; but (as Azuni remarks) it is soon fatigued when pursued over level ground, though from their nimbleness they can seldom be approached in their native wilds. There they bound with surprising vigour, "jumping from rock to rock at the distance of many feet, and if hard chased to the extremity of a cliff from whence it can reach no other, it will throw itself over, and with astonishing agility pitch upon its horns, without receiving any hurt."—(Boswell's Corsica, p. 41.) The same is stated of *O. Tragelaphus* in Jackson's 'Account of the Empire of Morocco.' This animal inhabits the wilds of Corsica and Sardinia, and never quits the highest ridges, where the temperature however does not allow of permanent snow. In general they live in small herds, headed by an old male, but unite occasionally into flocks of a hundred or more, which separate again when the rutting season commences, and the usual battles have decided how many females each male can retain. The females yearn two lambs in April and May. When brought up tame, the adult male is a capricious and violent little animal, ever ready to butt at strangers the moment their back is turned, or they look for an instant in another direction. I have seen one run at and butt against a post again and again, merely for amusement; and when grazing, it often rubs the herbage violently with its horns, which it makes full use of on all occasions. It is active, curious, impudent, and lascivious, perfectly fearless, and propagates readily with the domestic Sheep, though only under circumstances of restraint, (as noticed in the text.) Azuni and other authors notice their flesh to be equal to the finest mutton; and the mountaineers are said still to convert their skins into vests, and a kind of cloak, which, it has been remarked, may be the present representatives of the *Mastrucæ Surdorum*, noticed in the commentaries on Cicero, as made from the skin of the Moufflon. This dress was worn in particular by the inland robbers, the *Mastrucæ latrunculæ*.—E. B.

horns have more the curvature of those of the latter species, but are not so robust, and curve round gradually backward from the base, instead of at first diverging straightly, as in *O. Gmelini*; but the colour of the coat would appear to resemble that of the Corsican Moufflon, only without the rufous cast, and the specimen figured wants also the saddle-like triangular white patch, which I suspect is never absent in the Moufflon of Sardinia and Corsica. The *Tragelaphus* of Belon, it is true, observed by that author in Candia and in Turkey, is described by him to have "horns similar to those of Goats, but sometimes gyrted like those of a Ram;" yet the fact of a nearly similar flexure of horn to that represented by Messrs. Brandt and Ratzeburg proving to be of normal occurrence in the allied Armenian wild Sheep, confers additional probability on the supposition that the Berlin specimen of the Cyprian Moufflon has also normally curved horns, which alone would go far to establish its claim to rank as a species, in which case it might bear the appellation of *O. Ophion*.*

13. *O.—Ixalus Probaton*, Ogilby.—I stated in my former paper an opinion, to which I am still disposed to adhere, that this animal is no other than a genuine Sheep, but specifically distinct from any at present known: the specimen had long lived in captivity, as is obvious from the manner in which its hoofs had grown out; but whereas I formerly sought to account for its absence of horns, by ascribing this to probable castration at an early age, I am now inclined to consider that this abnormality, for such there is every reason to suppose it, was individually congenital, as in other rare cases before alluded to. The Armenian wild Sheep approaches more nearly to this species than any other as yet discovered; so much so, that before actually comparing them, I thought that they would prove to be the same; but they are nevertheless distinct, as is particularly shewn by the longer and less

* It is worthy of notice that the Cyprian animal bears about the same relationship to the Corsican Moufflon, which *O. Gmelini* does to *O. Vignei*. It is therefore, also, probably distinct. In an original description of the island of Milo, published in the Penny Magazine, (No. 136,) we read that, on Mount St. Elias, "still higher up, the surface was broken into fine bold crags, among which we were told that, as in Candia, and one or two of the larger islands of the Archipelago, the Moufflon is still to be found. We, however, certainly saw nothing of the sort; and on enquiring afterwards of some of the old inhabitants, we did not receive *very* satisfactory assurances that they had ever seen any."—E. B.

slender tail of the present animal, and the very different texture of its coat ; the absence of dark markings on its face and limbs may prove to be an individual peculiarity. The specimen is of the size of a large tame Sheep, and entirely of a chestnut-fulvous colour, dull white beneath and within the limbs, also on the lips, chin, lower part of the cheeks, and at the tip of the tail. From nose to base of tail it measures about fifty inches, the tail half a foot, and height of the back two feet and a half. From nose to rudiment of horn nine inches, and ears four inches : the vestiges of horns, which exactly resemble those found upon many breeds of tame Sheep, are two inches apart. Upon the minutest examination of the specimen, I can perceive no character whatever to separate it from the genuine Sheep, nor any distinction more remarkable than the trivial circumstance of its chaffron not being bombed, as usual, which however is equally the case with *O. Tragelaphus*. I have been favoured, however, by Colonel Hamilton Smith, with a drawing of an animal observed by himself on the banks of the Rio St. Juan in Venezuela, which appears to accord so nearly with *Ixalus Probaton*, except in the particular of bearing horns similar to those of the Rocky Mountain Goat, that its absolute identity is probable, in which case it would be curious that a species so very nearly allied to the genus *Ovis*, should yet differ from it so considerably in the character specified. The South American animal adverted to, is the *Aploceros Mazama* of Colonel Smith, and is probably congeneric with the *Pudu* of the Chilian Andes, mentioned by Molina, (the existence of which would appear to have been lately re-ascertained by M. Gay,) and also with the fossil *Antilope Maquiniensis* of Dr. Lund : there would indeed appear to be other living species of this type, more or less distinctly indicated by different authors.

14. *O. Aries*, Linnæus, the Domestic Sheep.—Assuming that different species have commingled to produce this animal, as appears to be very evident in the instance of the Dog, it is still remarkable that we have certainly not yet discovered the principal wild type, nor indeed any species with so long a tail as in many of the domestic breeds, which I cannot doubt existed also in their aboriginal progenitors : nothing analogous is observable among the endlessly diversified races of the Domestic Goat, which all appear to have been derived exclusively

from the Caucasian *C. Ægagrus*; and as in my former paper I suggested the probability that a wild Sheep more nearly resembling the domestic races than any hitherto discovered, would yet occur somewhere in the vicinity of the Caucasus, it now appears that such an animal does exist in Central Persia, as noticed in my description of *O. Gmelini*: nor should it be forgotten, that Hector Boetius mentions a wild breed in the island of St. Kilda, larger than the biggest Goat, with tail hanging to the ground, and horns longer and as bulky as those of an ox.* Pennant remarks upon this subject, that such an animal is figured on a bas-relief taken out of the wall of Antoninus, near Glasgow.

Of all the wild species of true *Ovis* that have been here described, the Rass of Pamîr approaches nearest to *O. Aries* in the character of its horns, though differing in one particular besides size, that has been pointed out, namely, that the two front angles are about equally developed, whereas in *O. Aries*, as in the Moufflon, the inner angle is more acute to near the base. Some experience in the deduction of the specific characters of Sheep horns enables me to state with confidence, that the character of the long-tailed domestic breeds of Europe, and also of most other breeds, is intermediate to that of the Rass and that of the Moufflon, combining the flexure and the prolongation of the former with the section of the latter, but becoming proportionally broader at the base than in either; more as in the Argalis of Siberia, Kamtschatka, and North America. That *O. Aries* is totally distinct from all, I have been long perfectly satisfied, and examination of the Rass in particular has strongly confirmed me in this opinion. I think it likely, however, that more than one wild species have commingled to form the numerous domestic races, though certainly not any that have been described in this paper. It is not very long since the question was habitually discussed, whether

* Two crania of Sheep, apparently male and female, from the Irish peat, in the possession of the Earl of Enniskillen, and exhibited sometime ago at a meeting of the Geological Society, are probably of this race.

Here I may mention, that among the numerous valuable fossil remains from the Sivalik deposits, presented to the Asiatic Society by Colonel Colvin, (as noticed in the Journal of the Society, vol. v. p. 183), I have determined a large fossil Sheep (allied to, if not identical with the Argali), a fossil Ibex, which I shall take an early opportunity of figuring and describing.—E. B.

the tame Sheep has descended from the Argali of Siberia, or the Moufflon of Corsica; and now that so many more indisputably distinct wild species have been added to the catalogue of this genus, it is probable that we are still far from having ascertained the complete existing number; but that several more yet remain to be discovered upon the lofty table-lands and snowy mountains of middle Asia, from the Caucasus and Taurus to the Altai, and among them, it is very probable, some much more nearly allied to the domestic races than any at present known.

The whole of the foregoing animals appertain to my subgeneric group *Ovis*, as distinguished from *Ammotragus*, which latter is characterized by the absence of suborbital sinuses, like the Goats, but differs from the latter by possessing interdigital fossæ, as in other Sheep. This difference between the Goats and Sheep appears to have been first noticed by Pallas, and has since been descanted upon by Professor Géné in vol. xxxvii. of the 'Memorie della Reale Accademia delle Scienze di Torino.' The fact of such a diversity in genera so nearly allied in habitat as the Goats and Sheep, renders the problem of the utility of the structure in question somewhat difficult of solution. The species upon which I found the subgenus *Ammotragus*, has decidedly an Ovine, rather than a Caprine, aspect, when viewed alive; the male emits no stench, as in the Goats; the bleat is precisely that of *Ovis*; and the animal butts like a Ram, and not like a Goat. Unlike the other species of admitted wild Sheep, as well as the long-horned or true wild Goats, it has a concave chaffron, and no markings on the face and limbs: its tail is rather long, which is the case in no species of *Capra*, and is also remarkable for being tufted at the extremity. The indigenous habitat, North Africa, is a further peculiarity in the genus in which it is here placed, though two species of wild Goats respectively inhabit Upper Egypt, and the snowy heights of Abyssinia.

15. *O. Tragelaphus*, Pallas, the African Goat-sheep.—This animal appears to vary considerably in size, some exceeding a Fallow Deer in stature, while others are much smaller. It has no beard on the chin, like the true Goats, but is remarkable for the quantity of long hanging hair in front of the neck, and on the upper part of the fore limbs, the former attaining in fine males to about a foot in length,

and the latter to nine inches; there is also some lengthened hair at the setting on of the head, and a dense nuchal mane, the hairs of which are three inches long, continued over the withers till lost about the middle of the back. General colour tawny, or yellow-brown; horns moderately stout, turning outwards, backwards, and so inwards, with the tips inclining towards each other.

The splendid male in the British Museum measures 5 feet from nose to tail, and tail 9 inches, or with its terminal tuft of hair 13 inches; height of the back $3\frac{1}{2}$ feet, but the living animal would not have stood so high by some inches; from muzzle to base of horn 11 inches, and ears 5 inches. The finest pair of horns which I have seen are in the same collection, and measure 25 inches over the curvature, $10\frac{1}{2}$ round at base, with an antero-posterior diameter of $2\frac{1}{2}$ inches inside; they diverge to 23 inches apart, measuring outside, at a distance of 6 inches from the tips, which latter return to 15 inches asunder; their span from base to tip inside is 13 inches: at base they are closely approximated, but not quite in contact. General form subquadrangular for nearly a foot, then gradually more compressed to the end, and having a very deep longitudinal furrow for the greater portion of their length outside, above which the horn bulges: there is a mark of annual growth at $1\frac{1}{4}$ inch from the base, another $1\frac{1}{2}$ inch further, and a third after an interval of 3 inches; but the rest are too indistinct to be made out with certainty among the wrinkles of the horn. A large pair of female horns were 16 inches long; $7\frac{1}{2}$ round at base; their widest portion apart, near the tips, 19 inches; and the tips $17\frac{1}{4}$ inches: their surface is marked with broad transverse indentations, which in the males ordinarily become more or less effaced with age. The female of this species is a third smaller than the other sex; and a lamb in the collection of this Society is extremely kid-like, with the spinal mane upon the neck and shoulders very conspicuous, but no lengthened hair on the fore-neck and limbs; in the half grown male, the latter especially is still not much developed.

This species is well known as the *Aoudad* of the Moors, and the *Kebsh* of the Egyptians; it is also, according to Rüppell, the *Tedal* of the inhabitants of Nubia, which is doubtless the same as *Teytal*, applied by Burckhardt to the Wild Goat of that region, in addition to the word *Beden*, which (in common with Rüppell and others) he also as-

signs to the latter. Sir Gardner Wilkinson, however, confirms Burckhardt by informing us, that the Goat referred to is called in Arabic *Beddan*, or *Teytal*, the former appellation referring to the male only. This author adds, that the present species "is found in the eastern desert, principally in the ranges of primitive mountains, which, commencing about lat. $28^{\circ} 40'$, extend thence into Ethiopia and Abyssinia." According to M. Rüppell, "it is found in all North Africa above 18° , in small families, and always upon the rocky hills;" frequenting the steepest and most inaccessible crags amid the woods and forests of the Atlas, and descending only to drink. It is a wonderfully agile leaper, even more so than the wild Sheep and Goats generally, and is remarkable for always browsing in preference to grazing. The *Ovis ornata*, figured by M. Geoffroy in the great French Work on Egypt, would appear to be merely a small sized individual.

The following may serve for definitions of the various ascertained species of Wild Sheep that have been here described:—

O. Polii, Blyth. *O. cornibus maximis triquetris, angustis altissimisque; angulis anterioribus equalibus: extrorsum spiraliter gyratis, et tam prolongatis quam sunt cornua Arietum domesticorum longissima: sulcis transversim indentatis; colore pallido.* Animal non cognotum est, sed *O. Ammoni* magnitudine saltem haud inferius. Habitat apud planitiem elavatam *Pamir* dictam, in Asiâ centrali.

2 *O. montana*, Desmarest.—*O. cornibus maximis triquetris, crassissimis, et sæpe inter angulos tumidis, ad apicem compressioribus; sulcis transversim indentatis; deorsum et antrorsum gyratis ad parallelum, apicibus extrorsum eductis; colore pallido, sed sæpe rufo-brunneo suffuso.* Animal ad magnitudinem *Cervi Elaphi* appropinquans, sed artubus brevioribus; pilis griseo-fulvis pallidis, maculis genericis super facie, pectore, artubusque fuscis; caudâ brevissimâ, et disco albescente circumdatâ. Habitat apud Americæ septentrionalis montes occidentalem versus.

3. *O. Ammon*, Pallas.—Diversitas hujus speciei ab præcedente non cognota est, quamvis patria differt, hæc in Siberiâ Orientali habitante; tertia alia species ambobus distincta regione intermediâ Kamtschatkæ invenitur, itidem simillima, tamen (apparenter) facillimè dignoscenda; viz.

4. *O. nivicola*, Eschscholtz.—*O. cornibus triquetris*, et inter *cornua Polii* et *Montanæ* *Ovium* apparenter intermediis; apicibus magis prolongatis quam in *O. montanæ*, sed ad basin crassioribus; potius quàm in *O. Polii* prolongatis, sed cornibus utriusque minoribus. Magnitudo hujus animalis inferior est, et pilorum color flavescens, sine disco caudali. Habitat apud montes Kamtschatkæ.

5. *O. Californiana*, Douglas.—*O. cornibus crassis triquetris*, ad apicem compressioribus; sulcis transversim indentatis; curvamine aperto extrorsum (non antrorsum) gyrautibus, apicibus plurimum extrorsum ductis; colore pallido, aut rufo-brunneo paulum suffuso. Magnitudo Ammonis vel paulum inferior: caudâ elongatâ, et non (?) disco pallido circumdatâ. Habitat apud Californiam, et regionem proximam Americæ continentis.

6. *O. Nahoora*, Hodgson.—*O. cornibus crassis subcylindraceis*, suprâ magis planiusculis, culmine abruptiore medio, dimidio-distali compressiori, et extrorsum arcuatis, apicibus retortis: sulcis transversis obsoletis; colore pallido. Magnitudo Arietis grandis; pilis griseis, vel in junioribus adultis fulvo terminatis, maculis genericis fuscis; caudâ brevi et floccosâ. Habitat apud regiones medias montium Himalicorum, et in Tibeta Magnâ.

7. *O. Burrhæ*, Blyth.—*O. cornibus crassis subcylindraceis*, supra convexioribus, culmine longitudinali minus abrupto, et aliis angulis minùs prominentioribus quàm in specie præcedente, subequalioribus; in arcu extrorsum curvatis, apicibus retrorsis; sulcis transversis obsoletis; colore nigrescenti-rubido. Magnitudo inferior est *Nahoori*, sed forma robustior; pilis castaneo-brunneis intensis; maculis genericis nigris et distinctis; caudâ minimâ (?) et non floccosâ. Habitat apud montium Himalicorum regiones summas.

8. *O. cylindricornis*, Blyth.—*O. cornibus maximis cylindraceis*, in arcu extrorsum (?) sine diminutione curvatis, apicibus non cognitis; sulcis transversis obsoletis: colore nigrescenti-rubido. Habitat apud Caucasum.

9. *O. Gmelini*, Blyth.—*O. cornibus triquetris et robustis, altis, et transversim sulcatissimis*; in arcu retrorsum divergentibus, apicibus introrsum ductis; colore pallido. Magnitudo Arietis; pilis brevissimis, et castaneo-fulvis splendidè coloratis; maculis genericis subdis-

tinctis, sed lineâ pilorum longiorum nigrâ infra collum in mare solo excipiendâ, apud pectore se expandente, et in utroque sexu cæsarie rudimentâ brachiis, sicut in *Ove Tragelapho* : caudâ brevi et gracillimâ. Habitat apud Armeniam, et provincias Occidentales Persiæ septentrionalis.

10. *O. Vignei*, Blyth.—*O. Musimoni* simillima, sed magnitudine *Cervi Damæ* grandis æquans, artubusque longissimis: cornibus robustis, compressis, et subtriquetris, angulis anterioribus equalibus; lunatim non spiraliter gyratis; et sulcis transversim indentatis: colore pallido. Corporis pilis rufo-brunneis; facie artubusque lividis; ventre, et annulis supra ungulas albis; lineâ laterali nigrâ, pedibus annulo secundo nigro anticè albo super marginato notatis; apice caudæ (brevis et gracilis,) et lineâ pilorum paulum pendentium infra collum medium ad pectus tendente, nigris. Habitat apud Asiam centralem—Varietas cornibus extrorsum gyratis, cum angulo interiori prominentiori.

11. *O. Musimon*, Linnæus.—*O.* cornibus compressis, ad basin triquetrioribus, angulo interiori prominentiori; lunatim gyratis, et sulcis transversim indentatis: colore pallido. Magnitudo Arietis parvi, caudâ brevi et magis villosâ: pilis rufo-brunneis; facie lividâ cum capistro, ventre, clunibus, dimidiisque artum inferioribus, albis; et lineâ laterali, caudâ, pectore, et membrorum plerumque dimidiis superioribus, nigris: maculâ triangulari alba utroque lumbo conspicuâ. Habitat apud insulas Corsicæ et Sardiniae, et forsan provinciam Murciæ in Hispaniâ.

12. *O. Ophion*, Blyth.—*O. Musimoni* simillima, sed cornibus retrosis, apicibus accurvatis: pilisque brunneis, et non rufescentibus (?) Habitat apud Cyprum, et forsan regiones alias Levantinas.

13. *O. Aries*, Linnæus.

14. *O*——? *Ixalus Probaton*, Ogilby.—Magnitudo Arietum maximorum, caudâ paulum elongatâ, cornibus in specimine solo cognoto abnormaliter (?) rudimentalibus, pilis castaneo-fulvis, et infra albescentibus.

15. *O. (Ammotragus) Tragelaphus*.—*O.* cornibus magnis subquadrangularibus, moderatè crassis, ad apicem compressoribus, sulcis transversim indentatis; divergentibus et retrorsum curvatis, sed prope basin rectis, apicibus acclinatiss; colore pallido. Magnitudo *Cervi Damæ* superior, pilis flavescenti-brunneis; collo jubato, et infra

cum pectore brachiisque capillato, caudâ elongatâ extremitate villosâ; facie non convexâ—ut in omnibus speciebus aliis, sinibusque suborbitalibus nullis. Fæminâ semper (?) cornutâ, cornibusque fortioribus quàm in fæminis specierum hujus generis cæterarum, quæ sæpe non cornutæ sunt, sed plurimæ cornua parva, tenuissima, et compressiora ferunt, quæ in maribus junioribus aut curvata sunt, aut sæpe rectiora. Habitat apud Africæ septentrionalis montes rupestres.

A connected view of the species of Lichens, with their Botanical relationship existing between them and the Indian productions. By HENRY COPE, ESQ.

HENRY TORRENS, ESQ.

Secy. Asiatic Society.

DEAR SIR,

As many of the Lichens which are indigenous to the Himalayan range, are closely allied by generic or (less proximate) family characters to the different species which have been used in Europe in the arts, or as articles of food for men or animals, it may perhaps be useful to present to the Society and those of its Members, who are interested in the subject, a connected view of those species, as the Botanical relationship which exists between them and the Indian productions, may lead to further investigation. I am indebted to Sir W. J. Hooker's sequel to the English Flora, for the chief portion of what I have now the honor to submit.

The Lichens of England, which with those of Europe generally, have even a closer affinity as regard their Botanical characters with those of the Himalayas, than the more conspicuous portions of vegetable productions, are divided by Hooker into seventeen families, comprising thirty-nine genera, of which eleven are distributed through seven families, exhibit species useful to man or beast; and it is an interesting fact that of these eleven, five belong to our family, the *Umbilicariæ*, and that to this same family appertain the species most frequently found in the Himalayas.

As, however, Dr. Hooker's notes will be more interesting than any observations of mine, I shall proceed at once to extract them, commencing with

Variolaria faginea, Pers.

The intensely bitter taste of this Lichen, according to Messrs. Turner and Borns, distinguishes it from every species hitherto discovered. It is upon this circumstance, which we have never found to vary, that we have been induced to place our chief reliance in making *V. faginea* and *discoïdea* distinct. Mons. Braconnot detected in this and several other crustaceous Lichens, oxalic acid; in the present plant in such abundance, that 100 parts yielded 18 of lime, combined with 29.4 of oxalic acid, nearly the same quantity in other crustaceous Lichens, and he remarks, that oxalate of lime bears the same relation to the *Cryptogamia*, as carbonate of lime to corals, and phosphate of lime to the bony structure of the more perfect animals. It diminishes, however, in the family of Lichens in proportion as the species lose their general crustaceous texture, and approach more and more to the membranous or cartilaginous, although the latter also contain a considerable portion of salt. M. Braconnot strongly recommends the adoption of *V. faginea* in the production of oxalic acid, and an eminent French chemist now informs me, that it is so employed in France, and upon a very extensive scale.—*English Flora*, vol. v. p. 169.

Note.—Dr. Royle notices numerous species of crustaceous Lichens as indigenous to India generally, and as found both on rocks and trees; they belong to the genera *Lecanora*, *Lecideæ*, *Lepraria*, *Verrucaria*, &c.—*Illustrations* vol. i. p. 437.

Lecanora Parella, Ach.

This is the Parelle of Auvergne and other parts, where it is extensively employed to produce a dye far superior to that of the Cudbear, and quite equal to that of the Archil.—*English Flora*, vol. v. p. 191.

Note.—The Parelle which grows chiefly on basaltic rocks, is inferior to *Rocella tinctoria*, (Archil,) in not bearing ebullition, and has the disadvantage of not answering with alum, which destroys the colour.—*Ure's Dictionary of Arts*, p. 52.

Lecanora tartarea, Ach.

This is the famous *Cudbear*, (so called after a Mr. Cuthbert, who first brought it into use,) employed to produce a purple for dyeing woollen yarn, and nowhere perhaps used to so great an extent as in the manufactory of Mr. MacIntosh of Glasgow. This gentleman imports it largely from Norway, where it grows more abundantly than with us; yet in the Highland districts, many an industrious peasant gets a living by scraping off this Lichen with an iron hook and sending it to the Glasgow market. When I was in the neighbourhood of Fort Augustus some years ago, I was

informed, that a person could earn 14s. per week at this work, selling the material at 3s. 4d. the stone of 22lbs. The fructified specimens are reckoned the best.

A remarkable and fructified state of this plant, as it appears to me, is imported by Mr. MacIntosh from Sicily, with the crust singularly thick, and formed into warts so exceedingly elongated and cylindrical, that they appear like the podatia of an *Isidium*.—*English Flora*, vol. v. p. 191.

Note.—The *Lichen tartareus* dyes crimson red. In Jutland, *Cudbear* is made from it by grinding the dry Lichen, sifting it, then setting it to ferment in a close vessel with ammonia. The Lichen must be the third year's growth to yield an abundant dye, and that which grows near the sea is best. It loses half its weight by drying. A single person may gather from 20 to 30lbs. a day in situations where it abounds. No less than 2,239,685lbs. were manufactured at Christiannsund, Flekkefiort, and Fahrsund in Norway, in the course of the six years previous to 1812. [This gives an average of 166 tons per annum, which at the then market rate of £60, or upwards, yields a sum of £9,960, as the yearly proceed accruing from the sale of a plant, which its appearance would lead the casual observer to consider as worthless.—H. C.]—*Ure's Dictionary*, p. 53.

Parmelia saxatilis, Ach.

In Scotland is collected abundantly by the peasantry with *P. omphalodes*, to dye woollen stuffs of a dirty purple. It grows on trees, rocks, and stones, especially in mountainous districts.

Note.—The principal species of *Parmelia*, which I have sent for examination is very likely the *P. perforata*, the very next species in the English Flora to the above two.—H. C.

Peltidea aphthora, Ach.

This is the finest British species of the genus. It derives its name from a circumstance related by Linnæus, that the Swedish peasants boil it in milk as a cure for the aphthæ or thrush in children.—*English Flora*, vol. v. p. 215.

Peltidea canina, Ach.

Formerly employed at the suggestion of Dr. Mead as a cure for the bite of a mad dog, whence the specific name.—*English Flora*, vol. v. p. 215.

Note.—Dr. Royle mentions this Lichen in his Illustrations as having been found in the Choor.—*Vol. i. p. 437*.

Gyrophora.

Various species of this genus, (and they are found in cold rocky situations, especially on granite in almost all parts of the world,) con-

stitute the *Tripe de Roche* of the Canadians, and with *G. proboscidea*, *G. vellea*, and a few other American species, Capt. Sir J. Franklin and his brave companions were supported in Arctic America during a season of want, such as happily few human beings have been subjected to. They are, however, bitter and nauseous, and can only be employed in the total absence of every other salutary food.—*English Flora*, vol. v. p. 217.

Note.—Berzelius has proposed removing the bitter principle of these Lichens, by macerating them in a weak solution of carbonate of potass, (one part to three hundred of water,) and afterwards washing them in cold water. This bitter principle has been called *Cetraria*, and imparts tonic properties to several of the species, as to *Borrera furfuracea* and others, which have been used for the same purpose as *Cetraria Islandica*, and some have been employed as a substitute for hops in the brewing of beer.—*Royle's Illustrations*, vol. i. p. 438.

Gyrophora Cylindrica, Ach.

Is used in Ireland occasionally as food, and more frequently for dyeing woollen cloth of a brownish green colour.—*English Flora*, vol. v. p. 218.

Cetraria Islandica, Ach.

Although this plant is abundant in certain districts of Scotland, it has never with us been collected as an article of commerce. A considerable proportion of what comes to our shops, where it is in great request as a medicine in coughs, consumptions, &c. is procured from Norway and Ireland. Immense quantities are gathered in the latter country, not only for sale, but for their own use as an article of common food; the bitter and purgative quality being extracted by steeping in water. The Lichen is then dried, reduced to powder, and made into a cake, or boiled and eaten with milk, and eaten with thankfulness too by the poor natives, who confess "that a bountiful Providence send them bread out of the very stones."—*English Flora*, vol. v. p. 271.

Note.—The starchy substance which renders the *C. Islandica* nutritive and demulcent, is called *Lichenin*.—*Royle's Illustrations*, vol. i. p. 438.

Rocella tinctoria, DeCand.

This interesting Lichen is the famous Archill or Orchill; Orseille of the French, which yields the most valuable dye of all this tribe. Its several names are derived from a Florentine family of the Oricellarii, Riccellarii, or Riccellai, one of whom in the year 1300, carried on a considerable trade in the Levant, and returning with great wealth to Florence, first made known in Europe, the art of dyeing with this plant. Far more abundantly than with

us, it is the product of warm climates on maritime rocks in almost every part of the world, and always growing with *R. fuciformis*, DeCand, which might almost lead to the suspicion, that they were mere varieties of each other. The Canary Islands formerly yielded this Lichen in abundance, whence it has been called Canary weed; but so great has been its consumption of late years, that the best quality of it, whose average price is £200 per ton, (about 1-12 per seer, or Rs. 70 per maund,) has become extremely scarce, and what is commonly imported from other countries, is not worth £30 the ton, or Rs. 10 per maund, (a trifle more than three pence a pound, or 4 As. per seer.) The English blue broad cloths are first dyed with Archil, which gives their peculiar lustre and purple tint when viewed in a certain light.—*English Flora*, vol. v. p. 221.

M. Robiquet has separated the colouring matter of this vegetable. The new and singular product which he has obtained has a very sweet flavour, is easily soluble in water, colourless, crystalizes in beautiful flat quadrangular prisms; by means of a moderate heat it may be volatilized without decomposing, and does not acquire the colouring property till it has undergone successively the action of ammonia and of common air.—*Silliman's Journal*, vol. 18, in *English Flora*, vol. v. add. and corrig. p. 10.

Note.—*Roccella fuciformis*, DeCand, is said by Dr. Royle, (*Illustr. vol. i. p. 438*,) to be more widely diffused than *R. tinctoria*, being found in Europe, Brazil, as well as in Ceylon and the Peninsula of India, whence several specimens have been sent to the Royal Asiatic Society; but it is far inferior in quality, containing indeed hardly any colouring matter.

Dr. Ure in his Dictionary of Arts and Manufactures, details under the article *Archil*, the different modes by which it may be rendered useful, and the reader who wishes to be acquainted with them cannot do better than consult the Dictionary. I may observe, that the *Chulchulera* of Hindoostan belongs to the Genera *Borrion* or *Evernia*, which are both in the same group with *ROCCELLA*, (the *Umbilicariæ*,) and closely allied to it in exterior characters.

Evernia Prunastia, Ach.

Was brought into use in Glasgow by the late Lord Dundonald, and employed (during the war) instead of gum in calico-printing, it afterwards fell into disuse as a very inferior substitute for that article.—*English Flora*, vol. v. p. 224.

The next useful species noticed by Hooker is *Ramalina Frazina*, Ach. which has been used in Glasgow for the same purpose as the *Evernia Prunastia*, (*Flora*, vol. v. p. 225); and from the apparent number of species of this Genus in the Himalayas, it might be turned to advantage.

In the next family the *Usneæ* are the *Usnea florida* and *U. barbata*, both abounding not only in the Himalayas, but in all parts of India, and in Ceylon, as well as in South America; where, according to Humboldt, the *Usnea barbata* is employed as a substitute for the *Roccella tinctoria*.

In the succeeding family, the *Corniculariæ*, we have the *Alectoria jubata*, Ach., or *Rockhair*, (which is found in the Himalayas as well as in Europe,) and is said by Linnæus to supply the rein-deer with food in winter when the snow is very deep upon the ground; for this purpose the Laplander cut down the trees, that the plant upon the topmost branches may be accessible to this useful animal.—*English Flora*, vol. v. p. 227.

The last useful species mentioned in Hooker, is the

Cladonia Rangiferina, Hoffm.

This for the greater part of the year, and especially in winter, is the support of vast herds of rein-deer, wherein consists all the wealth of the Laplanders. No vegetable, Linnæus tells us, grows throughout Lapland in such abundance as this, especially in woods of scattered pines, where for very many miles together, the surface of the sterile soil is covered with it as with snow. On the destruction of forests by fire, when no other plant will find nutriment, this Lichen springs up and flourishes, and after a few years, acquires its full size. Here the rein-deer are pastured, and whatever may be the depth of snow during the long winters of that climate, these creatures have the power of penetrating it and obtaining their necessary food. Linnæus has given a beautiful description of this Lichen, and of these animals whose support it is, in the *Flora Lapp.* p. 332, but it is too long for insertion in this place.—*English Flora*, vol. v. p. 235.

It appears (*Ure's Dictionary of Arts*, p. 53,) that the latest researches on the Lichens as objects of manufacture, are those of Westring of Stockholm. He examined 150 species, among which he found several which might be rendered useful. He recommends that the colouring matter should be extracted in the places where they grow, which would save a vast expence in curing, packing, carriage, and waste. He styles the colouring substance itself cutbear, persio or turnsole; and distributes the Lichens as follows: [Ure applies to all the generic name of *Lichen*. I have endeavoured to supply the new nomenclature from Hooker.* H. C.] 1st, Those which left to themselves exposed to moderate heat and moisture, may be fixed without a mordant upon silk or wool, such are the *L. cinerea*, (*Urceolaria cinera*, Ach.); *L. hæmatonta*; *L. ventosus*, (*Lecanora ventosa*, Ach.); *L. corallinus*, (*Isidium corallinum*, Ach.); *L. Westringii*, (*Isidium Westringii*, Ach.); *L.*

* And have marked those with a (*) which are indigenous to, or have congeners, in the Himalyas.

saxatilis, (*Parmelia saxatilis*, Ach.); *L. conspassus*; *L. barbatus*, (*Usnea barabata*, Ach.); *L. plicatus*, (*Usnea plicata*, Ach.); *L. vulpinus*, Hud., (*Borreria flavicans*, Ach.); &c.

2. Those which develop a colouring matter fixable likewise without mordant, but which require boiling and a complicated preparation, such are *L. subcarneus*; *L. farinaceus*, (*Ramalina farinacea*, Ach.); *L. jubatus*, Linn. (*Olectoria jubata*, Ach.); *L. furfuracens*, (*Borreria furfuracea*, Ach.); *L. pulmonarius*, (*Sticta pulmonaria*, Hook.); *L. cornigatus*; *L. cocciferus*, (*Scyphophorus cocciferus*, Hook.); *L. digitatus*, (*Scyphophorus digitatus*, Hook.); *L. uncialis*, (*Cladonia uncialis*, Hook.); *L. aduncus*, &c. Saltpetre or sea salt are requisite to improve the lustre and fastness of the dye, given by this group to silk.

3. Those which require a peculiar process to develop their colour; such as those which become purple through the agency of stale urine or ammonia. Westring recommends the following mode of testing: he put three or four drachms of the dried and powdered Lichen into a flask, moistened it with three or four measures of cold spring water; put the stuff to be dyed into the mixture, and left the flask in a cool place. Sometimes he added a little salt, saltpetre, quick-lime, or sulphate of copper. If no colour appeared he then moistened the Lichen with water, containing one-twentieth of sal ammoniac, and one-tenth of quick-lime, and set the mixture aside in a cool place from eight to fourteen days. There appeared in most cases, a reddish or violet coloured tint. Thus the *L. cinereus*, (*Urceolaria cinerea*, Ach.) dyed silk a deep carmelite, and wool a light carmelite; the *L. physodes*, (*Parmelia physodes*, Ach.) gave a yellowish gray; the *L. pustulatus* (*Umbilicaria pustulata*, Schrad.) a rose red; *L. sanguinarius*, (*Lecidea sanguinarius*, Ach.) gray; *L. tartareus*, (*Lecanora tartarea*, Ach.) a crimson red, &c.

I cannot conclude these extracts without giving an account from Ure of the *Orcine*, the name of the colouring principle of the *Lichen dealbatus*, Ach. (*Isidium paradoxum* of the same author,) styled by Messrs. Turner and Boner, a most beautiful production. The Lichen dried and pulverized is to be exhausted by boiling alcohol. The solution filtered hot, lets fall in the cooling crystalline flocks, which do not belong to the colouring matter. The supernatant alcohol is to be distilled off, the residuum is to be evaporated to the consistence of an extract, and triturated with water till this liquid will dissolve no more. The aqueous solution reduced to the consistence of syrup, and left to itself in a cool place, lets fall at the end of a few days, long brown brittle needles, which are to be freed by pressure from the mother-water and dried. That water being treated with animal charcoal, filtered and evaporated, will yield a second crop of crystals.

These are *Orcine*. Its taste is sweet and nauseous, it melts readily in a retort into a transparent liquid, and distils without undergoing any changes. It is soluble in water and alcohol. Nitric acid colours it blood-red; which colour afterwards disappears. Subacetate of lead precipitates it completely. Its conversion into the *Archil* red is effected by the action of an alkali, in contact with the air.

When dissolved for example in ammonia and exposed to the atmosphere, it takes a dingy brown-red hue; but when the *Orcine* is exposed to air charged with vapours of ammonia, it assumes by degrees a fine violet colour. To obtain this result, the *Orcine* in powder should be placed in a capsule, alongside of a saucer containing water of ammonia, and both should be covered a large bell-glass; whenever the *Orcine* has acquired a dark brown cast, it must be withdrawn from under the bell, and the excess of ammonia be allowed to volatilize. As soon as the smell of ammonia is gone, the *Orcine* is to be dissolved in water; and then a few drops of ammonia being poured into the brownish liquid, it assumes a magnificent reddish violet colour. Acetic acid precipitates the red lake of Lichen.

If the above pages contain a single hint which have escaped the researches of your able Curator, or others interested in his researches, I shall be amply repaid for the small trouble of transcribing them, and have the honor to remain,

Sir,

Your obedient servant,

Dehlee, 5th October, 1841.

HENRY COPE.

A Fourth Memoir on the LAW OF STORMS IN INDIA, being remarks and documents relative to the loss of the Ship GOLCONDA, in the Tyfoons of 22nd to 24th September 1840, in the China Sea. By HENRY PIDDINGTON, ESQ.

This memoir has arisen out of a question proposed to me by Mr. Greenlaw, the active Secretary to the Marine Board, which was in substance this: "*On what day do you think the Golconda was lost?*" I found that the investigation which I undertook in order to reply to it with greatest possible precision, elicited facts of so much importance that they might be worth publication as a separate memoir; not only as records distinctly shewing the truth of the Law of Storms for the China Seas, but as affording to seamen a valuable practical lesson; for

as will be seen, we have here, of three, two ships which ran into the storms, of which one foundered, and the other was in great danger: while the third by heaving to, in due time and place, escaped all damage!

The *Golconda*, as my Indian readers well know, was sent from Madras, with the head quarters and a detachment of the 37th Madras Native Infantry on board, to reinforce the expedition in China. Together with her crew, there must have been nearly 400 souls embarked in her: she was seen on the 10th September standing out of the Straits of Singapore, by the *Calcutta Thetis*, as noted in Captain Roche's reply to my queries, and again in Lat. $13^{\circ} 44'$ N. Long. $112^{\circ} 58'$ E. by the *Thomas King*, as Captain Roche also states, since which time she has never been heard of. It is supposed she must have perished in the Tyfoon of the 22nd to 24th September, in which the *London Thetis* and the *Calcutta Thetis* both suffered greatly; the latter being dismantled.

It may perhaps be necessary to remark here, to those who are not professionally acquainted with the navigation of the China seas, that there are two routes from Singapore to Canton during the S. W. monsoon, the one being along the coast of Cochin China, and the other, the usual track, between the Macclesfield Bank and the Paracels. We are certain, from the *Golconda's* having been seen on the 18th September, that she took the usual route, which was also that pursued by the *London* and *Calcutta Thetis*; and as I shall shew, there seems to be the utmost probability that she ran into, or was overtaken by the centre of one of the hurricanes which those ships met with, in which she foundered. She was, I believe, an old ship; but her commander was a gentleman of much nautical knowledge and experience, though it is possible that, like so many more, he was not fully aware of the advantages derivable from due attention to this valuable class of knowledge.

As we have obtained the Log of the *Calcutta*, and a detailed report from the *London Thetis*, I have first given these. I have then followed them by a comparative table of the winds and weather at noon and midnight of each day; and finally by a summary, shewing how the evidence goes to prove distinctly enough, that there were *two* storms travelling, the one to the WNW. and the other to the NNW. as will be seen by a careful comparison of the table, and the outline chart.

This is an additional reason, when ships are in the proper quarter of the storm circle, for heaving to, rather than scudding.

Report of the Ship Thetis of London reduced to Civil time.

In compliance with your letter received this morning, I forward you the particulars of a gale of wind encountered in the China Sea in September, 1840.

19th September.—Light Southerly winds, with hot sultry weather

{	Thermometer,	86 $\frac{1}{4}$ °
{	Barometer,.....	29. 94
{	Lat. by Observation,	14° 94' N.
{	Long. Chron.	113° 39' E.

Calm during the night.

20th September.—South Easterly airs towards morning, noon calm and sultry.

{	Thermometer,... ..	87°
{	Barometer,	29. 90
{	Lat. observation, ...	14° 53' N.
{	Long. Chron... ..	114° 9' E.

P. M.—Light NW. winds, with gloomy sky and close weather, midnight close weather.

21st September—Noon rain and thunder, with squally weather, wind NW.

{	Lat. Observation, ...	15° 57' N.
{	Longitude, Chron....	115° 9' E.
{	Thermometer,.. ..	84°
{	Barometer,	29. 87

Sympiesometer very unsteady from 29. to 29.30 during these 24 hours.

P. M.—Wind at NW. with squalls and lightning in the NW.

8. P. M.—Finer weather, midnight squally. Barometer falling gradually, wind very unsteady between W. and NW. large drops of rain.

22nd September.—Daylight strong breeze at WNW., heavy sea from NE., sent down the top gallant yards and masts, and otherwise made snug; the sky very wild and threatening. Noon, glass still falling; sea rising higher from the northward, and the wind increasing at NNW. Furl'd the top-sails and lay to under try-sails.

{	Thermometer,	85½°
	Barometer,	29. 64
	Sympiesometer,	29. 12
	Lat. indift. Obsn.	16° 20' N.
	Longitude,	115° 30' E.

P. M.—Wind increasing at NW. till midnight, and gradually veering to WNW., blowing a violent gale with terrific squalls: Barometer still falling.

23rd September—A. M. Wind veered to West, blowing almost a hurricane. At 4 veered to WSW. still unabated, and at daylight veered to SW., force of the gale still unabated and continued so till noon; lightning all round, squalls very violent, but some appearance of amendment in the weather.

No observations. Position from observations next day.

{	Sympiesometer at noon,	28. 70
	Barometer,	29. 20
	Lat. Observation,	16° 40' N.
	Longitude,	116° 15' E.

P. M.—Gale moderating fast, veering to South; 5 P. M. made sail, and ran before it, sea rising *more than in the height of the gale*. Midnight, Barometer 29. 50.

24th September—A. M. Moderating, and veering to Eastward of South. Squalls with rain. Noon moderate winds SSE.

{	Lat. Observation,	18° 25' N.
	Longitude,	117° 20' E.
	Thermometer,	81½°
	Barometer,	29. 80

From this time till the 26th, on which day we arrived at Macao, the wind continued S. Easterly and moderate, and the sea very confused. I there heard that vessels which arrived the day before us experienced a gale, commencing at North and veering to *East*, instead of to the West, as I experienced it, and those who arrived a day or so after us, had experienced a strong steady SW. gale upon the 22d and 23d.

I also beg further to state, that the *Golconda*, now missing, sailed 24 hours before us from Singapore, also bound to Macao; and the *Thetis* of *Calcutta*, which ship arrived sometime after *dismasted*, I believe left Singapore a few hours after us. Another vessel in com-

pamy with us just before the gale arrived like ourselves without damage, all which circumstances would lead to the inference, that the gale was partial in its violence, as well as different in its direction. I shall be happy to communicate any further particulars, if I have omitted any thing you might wish to know.

The following Statement is abridged from the Log Book of the CALCUTTA THETIS, and the reply of Captain Roche, commanding her, to some queries addressed by me to him. The dates relate to civil time.

The *Calcutta Thetis* left Singapore on the 13th September at day light; she had light Southerly and SW. 3 and 4 knot (rarely 5 knot) breezes to the 20th; having passed Pulo Sapata at 9½ A. M. on the 18th, on which day at noon her Lat. was 10° 10' N. Long. 109° 24' E.; on the 19th she was in Lat. 11° 44' N. Long. 111° 16' E. Bar. 29.79 Ther. 92°. Current for the past 24 hours, NE. by E. 71 miles, having had 60 miles to the NE. the two preceding days.

20th September.—She was steering NE. with SW. and WSW. airs and fine weather. At noon. Lat. 12° 40' N. Long. Chr. 111° 56' 45" E. Bar. 29. 79. Ther. 89°. Current NE. $\frac{3}{4}$ E. 18 miles. At Midnight squally weather.

21st September.—Fine and smooth water; light airs from WNW. till 7 A. M. At noon Lat. 15° 20, N. Long. Chr. 112° 40' E. Bar. 29.70. Ther. 89°. A light drain of current to the NE.; 7 P. M. breeze freshening from NNW. with squalls. Course NE. going 6.4 knots. At midnight thick cloudy hazy weather.

22nd September.—Running to the NE. as before, with wind at NNW. to 4 A.M. when it was NW. Day-light thick unsettled weather, with a head sea; going 5 knots to NE. with wind WNW. Noon Lat. 14° 55' N. Long. Chr. 114° 17' E. Bar. 29.56. Ther. 86°. Current NE. $\frac{1}{2}$ N. 16 miles. Wind W by S.—P. M. strong breezes WSW. and SW. At 5 P. M. every appearance of bad weather; sea rising from NE. made all preparations. At 9° 30' heavy squalls, wind being at SW. from 6. P. M.; split the foresail. Midnight, ship under mizen trysail and fore topmast staysail, incessant and increasing squalls, and sea getting up from the SW.; heavy rain.

23rd September.—A. M. Blowing a tyfoon from SW. gusts tremendous, and in rapid succession. Bar. fell from 29.40 to 28.80 in

the two hours preceding midnight. Impossible to keep before the wind ; broached to twice. At 3 h. 30' A.M. blowing a perfect tyfoon from SW. ; hove to under the mizen try-sail. Day-light, tyfoon blowing most furiously, with a high turbulent sea, but vessel making good weather. 7 A. M. Gusts more furious, mizen try-sail blown away, and sails blowing from the yards, though secured by lashings. Wind SW. throughout. Ship lying to with head from NW. to N by W. During the morning lost mizen topmast and fore and main top gallant masts. Noon hurricane as before, sea high and cross ; wind veering to the Southward. Lat. account $15^{\circ} 50'$. Longitude account $115^{\circ} 13'$ E. Bar. falling gradually from noon of the 22nd to 10 P. M. of the same date, when it was at 29.40, and at midnight fell to 28.80 as before mentioned. Midnight the same, but squalls not so frequent or so heavy ; sea very cross ; wind SW.

24th September.—A. M. Wind marked SSW. Heavy tyfoon and high cross sea. Vessel labouring much. At 2 A. M. the Bar. at 28.70, the lowest depression. About this time the heaviest of the storm. Towards 4 P. M. Bar. rose gradually. Wind South at 5 A. M. Daylight moderating, but the wind falling fast, caused the ship to roll so much, that by noon she had rolled away her main-mast, and suffered much damage. Noon, Lat. $17^{\circ} 14'$ N. Long. account $115^{\circ} 11' 35''$ E. Bar. 29.40. Gale breaking and wind South. At 8 P. M. SSE. with hazy weather. The foremast was saved with much difficulty by cutting away the topmast and fore yard. At one time the vessel, by the pumps being stove by the fall of the mast, had three feet water in her hold. Midnight moderate and hazy.

25th September.—Noon, Lat. $18^{\circ} 25'$ N. Longitude $115^{\circ} 57'$ E.

Captain Roche remarks, that, “at the commencement we had a good deal of lightning, with not much thunder or rain, and indeed through the height of the storm scarcely any, till about between 2 and 4 A. M. of the 24th, after which the gale was on the decline. The Longitudes are from the means of three watches, which were found correct on making the land.”

I annex a tabular Statement, shewing the relative position of the two ships, as marked on the Chart annexed to the Memoir.

Tabular view of the Hurricane of 22nd to 24th September 1840, in the China Sea, as experienced by the ships THETIS OF LONDON and THETIS OF CALCUTTA.

Date.	Ships' Names.	Winds and Weather.	Lat. N.	Lon. E.	Bar.	Simp.	Ther.	Remarks.
19th Sept. at Noon.	{ London Thetis, ... Calcutta Thetis, }	Light Southerly, hot } and sultry weather, } Light SW. airs and fine,	0 /	0 /				
			14 20	113 39	29.94	0	86 ¹⁰ ₄	
20th Sept. at Noon.	{ London Thetis, Calcutta Thetis, }	Calms and Light SE. } airs, sultry, } SW. and WSW. airs } and fine, }	11 44	111 15	29.79	0	92 ⁰	
			14 53	114 9	29.90	0	87	
21st Sept. at Noon.	{ London Thetis, Calcutta Thetis, }	Light NW. winds, gloo- } my and close, }	12 40	111 57	29.79	0	89	At Midnight squally weather.
			15 57	115 9	29.87	29.30	{ 84	Noon rain, thunder, and squally; wind NW. Simp. very unsteady during this 24 hours.
		Light from WNW. till 7 P.M. at 7 breeze freshen- ing from NNW. thick cloudy weather, }	13 20	112 40	29.70	0	89	

Date.	Ships' Names.	Winds and Weather.	Lat. N.	Lon. E.	Bar.	Simp.	Ther.	Remarks.
22nd Sept. at Noon.	{ London Thetis, } Calcutta Thetis,	NNW. Increasing breeze { and sea, } W by S. strong breezes, ...	0 / 16 20	0 / 115 30	29.64	29.12	85½	{ Threatening; sea rising; glass falling, and wind increasing; hove to. { Increasing with gloomy wea- ther; running to the NE.
22nd Sept. at Midnight.	{ London Thetis, } Calcutta Thetis,	WNW. violent gale, { terrific squalls, } SW. Increasing and incessant squalls; running to the NE. and NW. since noon,	0 14 55	0 114 55	29.56	0	86	Bar. still falling.
23rd Sept. at Noon.*	{ London Thetis, } Calcutta Thetis,	SW. almost a hurricane, .. SW. furious typhoon, ly- ing to,	16 40 15 50	116 15 115 13	29.20 28.80	28.73 0	0	Sea getting up from SW. No abatement. High sea; lost mizen topmast.
23rd Sept. at Midnight.	{ London Thetis, } Calcutta Thetis,	About South, moder- ating fast, SW. Heavy typhoon, { squalls not so frequent, .. }	0 0	0 0	29.50 0	0	0	{ Bore up at 5 P.M. Sea high- er than in the gale. Sea very cross.
24th Sept. at Noon.	{ London Thetis, } Calcutta Thetis,	SSE. Moderate, S. Gale breaking, ..	18 25 17 14	117 20 115 35	29.80 29.40	0	81½ 0	{ Fine and squalls, wind SE. and moderate to Macao. A.M. Rolled away the main mast, &c.; at 8 P.M. wind SSE.

* Golconda probably lost about this time.

We have now to examine the construction of the Chart, and the evidence there is for the two storms as there laid down.

Taking first the *London Thetis*, as the vessel which was farthest to the northward, we find her on the 21st September with the wind at NW. with ugly weather, and the *Simpiesometer* warning her by its oscillations, of bad weather for the whole previous 24 hours; being moreover 0.50 to 0.80 below the Barometer!* The *Calcutta Thetis* had thick cloudy weather, with a smart breeze at NNW.; her Barometer sinking to 29. 70

At noon on the 22nd, the *London Thetis*, with the sea rising from the NE. and Northward, the wind increasing from NNW. the weather threatening, and the glasses still warning, very properly hove to under trysails. We may take the storm to have fairly begun with her now, and I have thus laid down its centre as bearing from her about 130 miles to the ENE., which, assuming it to be a circular storm, would give it a diameter of 260 miles.

The *Calcutta Thetis* at the same time has the wind a strong breeze at W. by S. to which point her NNW. breeze had gradually veered; her Barometer had fallen to 29.56, with threatening weather and a head sea, the ship always running to the NE. from 6 to 5 knots an hour. If we look at the circle of the *London Thetis* storm, we see that this could not be the same; for if we extended it to here, it would give us the wind at about NW. by W. instead of W. by S. while it is to be particularly noted, that the changes of wind which the *Calcutta Thetis* has from 7 P. M. of 21st to 4 A. M. and noon of the 22nd, are exactly such as should occur from a ship, and a circular storm running on the tracks which I have laid down: the ship in fact *chasing* the storm! Thus it will be seen that at 4 A. M. when it was NW. the first circle on the track of this storm makes it so, and this track must be the right one, because the wind being W by S. at noon, clearly shews, that the ship had passed to the Eastward of the meridian of the centre at that time, *i. e.* the centre was bearing N by W. from her if it was a circle. I do not fail to observe, that by this track she is placed within a much shorter distance of the centre at this time than afterwards on the 22nd at midnight, and during the 23rd, when the greatest fall

* A very beautiful instance of the importance of this invaluable instrument.

of the Barometer was experienced, and the storm was raging in its greatest fury ; but it does not appear to me, that the winds from noon of the 22nd, the time it was at W by S. to the following midnight, and to noon of the 23rd, when it was a steady SW. typhoon, allow us to assign any other track. We may either suppose that the storm was only forming on the 21st, or that the track curved away to the Eastward to account for this possible anomaly in the distance from the centres. It is certain a storm must begin somewhere, and I presume it here to have done so on the same line as that on which we find we can track it as a completely developed hurricane.

Again ; if we attempt also to extend the circles of this storm at this time, noon 22nd, to the *London Thetis*, we shall find that it would give a SSE. wind, instead of a steady NNW. one, with every appearance of a storm and this storm really setting in a few hours after, with exactly the changes of wind which should, by the theory, occur. I may perhaps be thought prolix in this explanation of my reasons for laying them down as two separate storms ; but I have thought it very essential to our object, which is both to register the facts, and to draw useful conclusions from them, to shew carefully upon what grounds any thing is supposed to be proved which we assume or lay down.

At midnight 22nd-23rd, we find that the *London Thetis* has a violent gale WNW. with terrific squalls and Barometer still falling. The WNW. wind would place the centre bearing NNE. from her, and allowing for her drift from noon, when she so prudently hove to, the centre at this time may be about where we have placed it. The *Calcutta Thetis* has the wind at this time at SW. a tremendous gale also, which of course makes the centre of her storm bearing NW. from her as I have placed it, and it will be observed that the same discrepancy would exist, as before if we attempt to extend the circle of the one ship's storm to the place of the other ; shewing I think to demonstration, (for the places of both ships are perfectly well ascertained,) that there must then have been the two storms which I have laid down.

There is a very remarkable fall of the *Calcutta Thetis*' Barometer ; viz. 29.40 to 28.80, or more than half an inch in the two hours preceding this epoch (midnight of 23rd) and we find that at 2 A. M. on the 21st

it had reached its maximum depression of 28.70. Now we have not, unfortunately, the *London Thetis'* Barometer for this moment, but we *may* suppose this fall to have arisen from the near appulse of the two tempests? There *may* have been a point, midway between them at which the barometrical depression arising from both storms may have operated, though the winds were directly opposed. What this produced we know not. It might have been a calm, but it was quite as probably, a succession of awful gusts from every quarter of the compass mixed with calms, (almost as dangerous in such weather,) much resembling the sort of weather which every seaman has seen near the line, on the coasts of Africa, or on those of Borneo, in violent thunder storms of long duration; but of course far more violent, and with a most dangerous sea. At noon of the 23rd, the *London Thetis'* storm having travelled onwards, as by the track, and the vessel having drifted the other way, she has the wind at SW. and "some appearance of amendment," though the Simpiesometer and Barometer are still at the lowest registered depression. By 5 P. M. she could bear up, the storm, having veered to South, and what is worthy of remark, we find that as she approaches and crosses the track we have laid down for that of the centre of the storm, she has then the "sea rising *more* than in the height of the gale,"! which is some evidence that we are not far wrong.

The *Calcutta Thetis*, which was now, providentially, lying to, had the weather at noon of the 23rd terrific; but towards midnight she has fewer squalls, the wind veering to SSW. after that time, and to South by daylight on the 24th. At noon, it fell so fast, that she rolled away her mainmast, and was nearly foundering by her pumps being destroyed by the fall of the mast.*

She did not cross the previous track of her own storm after she bore up, but that of the *London Thetis'* storm is close to her position at noon; and though the sea had had 24 hours to go down since the centre passed, the latter portion of it, and that part of the sea of the *Calcutta Thetis'* storm which reaches this point, may well have assisted to produce this dangerous sea.

I have thus shewn, I hope distinctly, and almost to a mathematical certainty, that there were two storms. From the logs of single ships,

* This is worthy the attention of seamen and owners. The pumps, especially in small vessels, seem placed to insure the most frequent occurrence possible, of this fatal accident; and no doubt vessels have been frequently lost through it.

the tracks are not easily laid down very correctly, so that allowance must be made for this imperfection. To say *where* the unfortunate *Golconda* perished is of course impossible, for like the *Calcutta Thetis*, which was in great danger, she may have foundered after the storm. The probability, however, is, that she was tempted by the Westerly breeze to run on, as the *Calcutta Thetis* was, and was thus lost by running into the centre of the tyfoon. There have been, even with our limited knowledge and field of research, so many instances of this kind, (See Third Memoir in Journal Asiatic Society, vol. ix, p. 1053) that we are not judging harshly, I think, if we suppose this awful loss to have arisen from another of them. The lesson afforded by this investigation is one which the dullest may read. Of three ships exposed to storms of the same kind, the commander of one, taking due warning, and probably well acquainted with the Theory of Storms, heaves to and makes all snug, which is what ought to have been done; for he was in the South-Western quadrant of a storm travelling across and ahead of him. The second, with less warning it is true, having apparently no Simpiesometer on board, and tempted by the fair wind, runs on and narrowly escapes foundering; for as will be seen, he runs along the South-Eastern edge of his storm; and the third we may easily suppose to have perished through an error of the same kind leading him farther and into the dangerous centre.

I ought not to omit remarking here, the exact confirmation of the theory, which we find in the report of the *London Thetis*, when Captain Cass mentions that the ships ahead of him had gales at North veering to Eastward. This is exactly what should occur, and proves to a certainty, that this tyfoon was a rotatory storm. I should mention also, that the storm-circles on the chart are not struck with any reference to the sizes of the vortices, of which we know nothing, but simply to shew the winds at noon and midnight; and from centres upon the supposed tracks of the tyfoons as far as these can be ascertained by careful projection.

112°

118°

ond Thetis 24th Noon

18°

18°

17°

17°

22nd Noon

n S.W.

Para

N. Latitude

16°

16° N. Latitude

15°

15°

14°

14°

Golconda
18°

13°

13°

Inch to a degree

Bailin d Thetis
1840.

Classified Catalogue of Mammals of Nepal, (corrected to end of 1841, first printed in 1832.) By B. H. HODGSON, Bengal Civil Service.

BIMANA.

O. Homo Sapiens.—Mass of population belongs to Kalmuc subdivision of the Great Mongolian stirps, with some admixture of Indian stock. In the *Tarai* and low valleys of the hills, are some traces of aborigines of Southern race, like the Bheels, Coles, &c. These latter are denominated Thárû, Denwâr, Durre, Manjhi, and Brahmoo.

N.B.—As to location, the following initial letters signify as follows:—H. is habitat, and G. after it is general, that is, both *Tarai* and all three regions of the hills. L. is lower hilly region. C. is central hilly region, and N. is northern hilly region. T. is *Tarai* and saul forest, or the plains at the base of the mountains. For a general sketch of features and character of the above four regions, see Catalogue as first printed *apud* Journal. Asiatic Society.

QUADRUMANA.

SIMIADÆ.

1. *Semnopithecus necnon Cercopithecus.*—Gen. ch. nobis. Facial angle 45 to 50: face flat: nose short with long narrow lateral nares: limbs long: thumbs small remote: no cheek pouches: 5th tubercle on last molar present or absent: callosities large: canines variable, large only in grown males: stomach sacculated and banded as well as intestines: tail very long, commonly tufted, and exceeding the length of the animal. Agile, grave, gregarious, not docile.

1. Sp. new. schistaceus nob. (*Nipalensis* of former catalogue, see remark at end.)

H. T. and L. more rarely C. and N. even.

2-3. *Macacus? Pithex*, Nob.—Gen. ch. nob. Facial angle 50: muzzle not elongated. Callosities and cheek pouches large. Buttocks often nude. Structure compacter, but generally like that of *Semnopithecus*; limbs shorter, thumbs larger, orbits more salient, head rounder, canines similarly variable, nares shorter,

rounder, and more terminal stomach simple. Cæcum and rectum sacculated. Tail equal to half the length of the animal. Agile, lively, gregarious, familiar and docile.

2. Sp. new. *Oinops et Pelops*, nob.

H. of the first, T. L. and C.—of the second, N.

VESPERTILIONIDÆ.

RHINOLPHINÆ.

4-5. *Rhinolphus*.—2 Sp. new. *Armiger et Tragatus*, Nob. H. C. so far as known.

PTEROPINÆ.

6-7. *Pteropus*.—2 Sp. new. *Leucocephalus et Pirivarus*, Nob. The first is alleged to be identical with *Medius* Auct; H. T. passenger in hills.

VESPERTILIONINÆ.

8-12. *Vespertilio*.—5 Sp. new. *Formosa, Fuliginosa, Subbadia, Muricola et Labiata* Nob. H. C. so far as known.

FERCÆ VEL CARNIVORA.

FELIDÆ, genus—FELIS, subgenera.

13-19. *Felis*.—7. Sp. *Tigris, Pardus, Leopardus, Macrocelis, Nepalensis* Auct. *Viverriceps et Murmensis*, Nob. *Viverriceps* is identical with *Viverrinus* Auct. Of 1, 2, 3. H. G.; of 4, 5, 7. C.; of 6. T. but Leopards are nearly confined to the hills.

20. *Lynchus*.—1. Sp. new. *Erythrotus*, Nob. apparently identical with *F. Chaus* Auct. H. G.

CANIDÆ, genus—CANIS, subgenera.

21. *Canis*.—1. Sp. domestic, two varieties of the Mastiff and two of the Terrier of Tibet; the Pariar of the plains, and cross-breeds with the first; of 4 first H. N.; of rest, G.

22-23. *Vulpes*.—2. Sp. *Indicus*, Nob. et *Montanus*, Pearson. *Indicus* is apparently identical with *Bengalensis*, *Necnon Kookri*, H. of first T; of second, C. and N.

24. *Sacalius*, Smith, *Oxygoüs*, Nob.—Jackall, 1. Sp. *Indicus*, Nob. var. of *Aureus*? H. G.

25. *Cúon* Nob.—General structure and dentition of *Canis*, but molars $\frac{6}{6} \frac{6}{6}$ only, the 2d tubercular being deficient. Odour and aspect of the last. Head blunter. Tail and ears larger. Teats 12 to 14. Venatory, gregarious, does not burrow.
 1. Sp. *Cuon Primævus* Nob. type.—*Canis Primævus* of Bengal. Asiatic Society's Transactions, (subsequently named the type-*Chrysæus* by Smith.) H. L. C. and N.

MUSTELIDÆ.

VIVERRINÆ.

- 26-27. *Herpestes*.—2 Sp. new. *Griscus*, Auct. et *Auropunctatus* Nob. The latter is alleged to be identical with *Edwardsii* Auct. H. T. and C. respectively.
 28-29. *Viverra* Auct.* Size large, robust habit, never climbs, thumb not remote, nails obtuse.
 2. Sp. new. *Melanurus* et *Civettoides*, Nob. H. G.
 303.1. *Viverricula*, Nob.—Size small, scansorial, habit vermiform, nails more or less raptorial, and thumb remote, pouch as in *Viverra*.
 2.—Sp. *Indica* et *Rasse* Auct. H. T.
 32. *Prionodon*.—1. Sp. new. *Pardicolor* Nobis, H. C. and N.
 33-35. *Paradoxurus*.—3 Sp. new. *Hirsutus*, *Nepalensis*. et *Laniger*, H. T. C. N. respectively.
 N. B.—First possibly identical with *Bondar*.
 36. *Ailurus*.—1 Sp. *Fulgens* Auct. the Wah, H. N.

MUSTELINÆ.

- 37-40. *Mustela*.—4 Sp. *M. Erminea* Auct and three new, *Hemachalanus* et *Calotis* et *Auriventer* vel *Cathia*, Nob. H. C.
 41. *Martes*.—1. Sp. *Flavigula* Auct. H. C.
 42-47. *Lutra*.—6. Sp. *Leptonyx* et *Nair* Auct. and four new. *Tarayensis* *Monticola*, *Indigitata*, *Aurobrunnea*, Nob. H. of 3 first is T.; of 3 next, L. and C.
 48. *Gulo*.—1. Sp. new. *Nipalensis*, Nob. (alleged to be identical with *Helictis moschatus* of Gray, and also with *Gulo Orientalis* of Horsfield.) H. L.

* These are differential characters merely and are ours. See *Viverricula*.

49. *Mesobema (olim Urva)* Nob.—Teeth as in *Herpestes*, but blunter; structure and aspect precisely mediate between *Herpestes* and *Gulo*. On either side the anus a large hollow smooth-lined gland secreting an aqueous foetid humour, which the animal ejects posteaally with force. No subsidiary glands, nor any unctuous fragrant secretion. Teats 6, remote and ventral; orbits incomplete. Parietes of the skull tumid, with small cristæ.

1. Sp. M. *Cancrivora*, Nob. type: the *Gulo Urva* of Asiatic Journal, Nob. H. L. and C.

URSINÆ.

50. *Ursitaxus*, Nob.—Molars $\frac{4}{4}$. $\frac{4}{4}$. of ursine flatness almost on the crown, but the last above transverse, and less than the carnassial tooth. Aspect and size of *Taxus*. No ears, coarse scant hair, anal glands as in *Mydans*. Genital organ bony, and annulated spirally. Typically plantigrade and fossorial. Carnivorous. Teats 4 in a transverse parallelogram.

1. Sp. *Inauritus* Nob. Indian Badger of Pennant and Hardwicke type. H. L.

N. B.—This form I still think is erroneously sought to be identified with *Ratelus Mellivorus*.

- 51-52. *Ursus*.—2. Sp. *Tibetanus* et *Isabellinus* Auct. H. of first is C. second N.

53. *Prochilus*.—1. Sp. *Labiatus* Auct. H. T.

SORECIDÆ.

- 54-56. *Erinaceus*.—3. Sp. *Spatangus Collaris*, et *Grayii* Auct. H. C.

- 57-58. *Sorex*.—2. Sp. *Indicus* Auct. et *Pygmæus* Nob. H. G.

59. *Talpa*—1. Sp. new. *Micrurus* Nob.* H. C. and N.

* Specific. Character Uniform velvet black with silvery grey gloss iridescent when moist; nude snout; feet and tail, fleshy white; the last very minute; structure otherwise typical. Snout to rump $4\frac{1}{4}$ inches. Head $1\frac{1}{4}$. Tail $\frac{3}{16}$. Palma and nails $\frac{7}{8}$. Planta and nails $\frac{13}{16}$.

UNGULATA.

PACHYDERMES.

60. *Elephas*.—1. Sp. Indicus Auct. two varieties, *Isodactylus* et *Heterodactylus* Nob. H. T.
61. *Rhinoceros*.—1 Sp. Indicus Auct. H. T.

ANAPLOTHERES.

62. *Sus*.—1 Sp. S. Aper Auct. the wild Boar, two varieties, *Aipomus* et *Isonotus* Nob. H. G.

EDENTATES.

63. *Manis*.—1 Sp. new. *Auritus* Nob. alleged to be identical with the common Indian type or *Pentadactylus*. H. G.

RUMINANTES.

BOVINÆ.

Genus *Bos*. Subgenera?

64. *Bos*.—Cranium moderate, proportional, or without excess in the cerebral or facial region; frontals shorter than the face, flat, and not broader than long. Occipital plane of the skull quadrangular, never arched along the culmenal line, nor indented by the temporal fossæ, smaller much than the frontal plane and forming an acute angle therewith. Horns attached to the highest line of the forehead, rounded, moderate, curved up or down or forward; 13 pairs of ribs; no true dorsal ridge, but sometimes a fleshy hump; dewlap and muzzle large and square.

1 Sp. and type, *Bos Domest*: Nipalese varieties of. H. G.

N.B.—These Bovine characters are all ours. See *Journal Asiatic*.

65. *Bibos Nobis*.—Cranium large, massive, exhibiting preponderance of the frontal and cerebral portion over the facial; frontals as long as the face, concave, broader than long, and surmounted by a large salient crest ascending above the highest bases of the horns. Occipital plane of the skull spheroidal, very large, larger than the frontal plane, deeply indented in its centre by the temporal fossæ, and forming an acute angle with

the frontal plane. Horns attached below the highest line of the frontals, massive but short, ovoid or subtrigonal, and curving ascendantly; thirteen pairs of ribs; a true dorsal ridge co-extensive with the ribs and terminating abruptly; dewlap and muzzle small; period of gestation longer than in *Bos*.

1 Sp. and type. *Bibos Cavifrons*: probably the *Bos Gaurus* of authors. H. T.

N. B.—*Gavæus*, an aberrant species leading to *Bos*?

66. *Bison*.—Cranium moderate, depressed, inclining to Bubaline forms in the excess of the facial portion over the frontal, and in the rounding off of the frontals into the occiput; frontals decidedly broader than long, more or less convex, and forming an obtuse angle with the semi-circular or trigonal occipital plane which is strongly ridged by the parietes at its summit, is smaller than the frontal plane, and moderately indented. Horns attached rather in advance of the parietal apex of the cranium, small, rounded, curving ascendantly, or out of the horizontal; 14 (or 15) pairs of ribs; a true dorsal ridge, but confined to the withers, and terminating posteally in a gradual slope; dewlap none; muzzle small. Types *B. Americanus* et *Pœphagus*.

1. Sp. *Pœphagus* in Nepal. H. N. and also Tibet.

67. *Bubalus*.—Cranium large, elongate, compressed or narrow, disproportioned, exhibiting great excess (a 3rd) in the facial over the frontal or cerebral portion; frontals short, narrow, convex, usually forming an obtuse angle with the occipital plane, which is large and circular in proportion to the obtuseness of that angle, and to the consequent rounding off of the culminal line of separation; parietals merged, not ridged as in the last, nor culmenal. Horns attached to the ends of the highest line of the skull, always exceeding in length that of the cranium, and usually greatly so, depressed, strictly trigonal, and neither ascending nor descending, but directed horizontally backwards; thirteen pairs of ribs; no true dorsal ridge nor fleshy haunch; muzzle large and square; dewlap medial.

1. Sp. and type, *Bubalus Arna*, fœm. *Arnee*, two varieties. *Macrocerus*, et *Speirocerus*, Nob. H. T.

ANTELOPIDÆ VEL CAPRIDÆ.

- 68-69. *Antelopa*.—2 Sp. *Cervicapra* Auct. et *Pennettii* Auct ? *Bharatensis*, Nob. Vulgo, the Chouka or Ravine Deer. It seems to be identical with *Africana* Auct. H. T.
70. *Pantholops* Nob.—Molars $\frac{5}{5}$ $\frac{5}{5}$, incisors erect, strong and rectilinearly ranged. Horns with clear sinus in cores, long, slender, erect, sublyrate, inserted between the orbits, compressed, nodose, and approximated at their bases. Large inguinal purses. No suborbital sinus. Nose ovine, bluff and hairy. Large intermaxillary pouches or subsidiary nostrils. Knees simple. Ears pointed, short. Tail short, full. Hoofs low, broad and padded with large interdigital pores. Size, habits, and general aspect of *Antelopa* et *Gazella*. Females hornless, with lesser inguinal purses, and two teats.
- 1.—Sp. new, and type *Antelope Hodgsonii* of Abel; the Chiru of Tibet. H. N. *transnivem*.
71. *Tetracerus*.—1 Sp. *Chickara neenon Quadricornis* Auct. Chousingha of Hindoos. H. T.
- 72-73. *Nemorhædus vel Kemas*.—2 Sp. *Goral* (*Hardwickii*) et *Proclivus* vel *Thâr* Nob. H. C. and N.
74. *Capra, wild*.—1 Sp. *C. Ibex* Himalayan variety and tame, two varieties of the common Goat and two of the Shawl Goat, or Sinal; 1 2, Doogoo; 3, Chângra; 4, Chappoo. H of 1, is N.; of 2, 3, C.; of 4, 5, N. and Tibet.
75. *Hemitragus* Nob.—General structure, odour, and horns of *Capra*, but having a small moist muzzle and four teats in the females; no interdigital pores. H. N.
- 1.—Sp. and type, *Capra Quadrimammis vel Jharal* Nob. C. *Jemlaica* of H. Smith?
- N.B.—Mr. Ogilby has unwisely confounded this type with his *Kemas*, the characters of which group were, by the by, first correctly stated by myself, as were those of *Hemitragus*. The *Goral* or type, or *Kemas* has, (besides a larger muzzle than that of *Jharal*,) interdigital pores; the *Jharal* or type of *Hemitragus* has none, wherefore Mr. Ogilby was especially bound by his own principles not to confound the two.
- 76-77. *Ovis, wild*.—2 Sp. new, *Ammonoides* Nob et *Nahur* Nob; and four tame varieties; viz. the *Hûnia*, *Bârwâl*, *Câgo* and *Silingia*. H. of 1, 2, is N.; of 3, N.; of 4, 5, 6, C.

CERVIDÆ.

Genus CERVUS—Subgenera.

78. *Cervus*.—1 Sp. *Elaphus* of the Saul forest, possibly a distinct species, *Affinis* Nob. Bara Singha of Hindoos. H. T.
79. *Pseudo-cervus* Nob.—1 Sp. *Cervus Wallichii* Auct. type. Tail nearly obsolete. Horns branched at the base as in *Cervus*, above as in *Rusa*, and quadrifurcate, size smaller.
N.B.—Alleged to be identical with *Affinis*. H. N.
80. *Rucervus* Nob.—Aspect and size mediate between *Elaphus* and *Hippelaphus*. Muzzle remarkably pointed. Horns moderate, smooth, pale; one forward basal process on each beam; no median; summit branched as in *Elaphus*. Canines in males only.
N.B.—These subgeneric characters are ours, and are confessedly frailly based, but not less so than the admitted distinctions. The whole family requires reconstruction.
- 1—Sp. new, *Cervus Elaphoïdes* Nob. H. T. This is identical with the *C. Duvancellii* of Cuvier.
- 81-83. *Rusa*.—Canines in both sexes. Heavily maned. Horns with one basal and one superior process, thick, dark, and pearly.
- 3.—Sp. new, *Jaraya et Nepalensis et Heterocervus* Nob.
N. B. *Jaraya* probably identical with *Hippelaphus et Aristotelis*. H. T. and L. rarely.
- 84-86. *Axis*.—3. Sp. 1st *Cervus Axis* Auct. or *Axis Major* Nob. 2nd *Axis Minor*, Lesser spotted Deer Nobis, and 3rd *Axis Procinus*. Smith. H. T.
87. *Stylocerus*—Sp. new, *Ratwah*, Nob. The Kaker and Barking Deer of Europeans. Probably identical with the insular type or *Cervus Muntjac*. H. T. L. and C.

MOSCHIDÆ.

- 88-90. *Moschus*.—3. Sp. new. *Leucogaster*, *Chrysogaster*, et *Saturatus*, Nob.
N. B.—*Saturatus* is probably identical with the *Moschatus* of Linnæus. H. N. and Tibet.
91. *Tragulus*.—1 Sp. new, *Mimenoides* Nob. Vulgo Bijay. H. T.

SOLIPEDES.

92. *Equus*.—1 Sp. two small tame Himalayan and Trans-Himalayan varieties. H. N. and Tibet.

RODENTIA. MURIDÆ.

- 93-94. *Mus*, *Rats*.—6 Sp. *Rattus* Auct.? *Rattoides* Nob. *Decumanus* Auct. *Decumanoides* Nob. *Nemorivagus*, et *Nitidus*, et *Hydrophilus*, et *Niviventer* Nob. H. C. and N. so far as known.
- 99-102. *Musculus* Nob. *Mice*.—4 Sp. new, *Cervicolor*, *Dumecolus*, *Nipalensis*, et *Dubius* Nob. H. C. and N. so far as known,
- 103-104. *Arvicola*? *Neotoma*.—2 Sp. new, *Pyctoris* et *Myothrix* Nob. also probably the *Hydrophilus* introduced above. H. C. and N.
105. *Arctomys*.—1 Sp. new. *Himalayanus* Nob. H. N. and Tibet.
106. *Rhizomys*.—1 Sp. new, *Badius* Nob. H. L. and C.

SCIURIDÆ.

- 107-109. *Sciurus*.—3 Sp. new, *Macruroides*, *Loeria* et *Locroides* Nob. H. L. C. and N. indifferently.
- 110-112. *Sciuropterus*.—3 Sp. new, *Magnificus* et *Chrysotrix*, et *Alboniger*. H. L. C. and N. rarely L.
113. *Hystrix*.—1 Sp. new, *Nipalensis* Nob. *Leucurus*. H. G.
- 114-115. *Lepus*.—2 Sp. new, *Macrotus* et *Oiostolus* Nob. H. of 1st, G. ; or 2nd N. and Tibet.
- N. B.—These are the *Indicus* et *Omodius* of former catalogue; but several local names are now dropt.
116. *Lagomys*.—1 Sp. *Nipalensis* Nob. H. N. and Tibet.

In all 116 species, of which probably 55 to 60 are new. Their descriptions, with four or five exceptions only, are to be found in the Journal of Bengal Asiatic Society, and in that of Mr. McClelland. The remaining four or five yet unpublished are forthcoming shortly. The catalogue is considerably enlarged since it was last published in Lin. Trans. A. D. 1838. Some uncertainty still hangs over the intimate structure of the murine animals, but all the rest have been carefully allocated in the modern genera after full examination of their conformation, while their special habitats have been determined upon accurate information.

I have lately seen a critique by Mr. Ogilby of my labours in this department, but I cannot say it is distinguished by much candour. It is well known, that when Mr. Ogilby wrote, several successive catalogues of mine, embodying the improving results of new information, and greater skill in the appreciation of it, existed; and had Mr. Ogilby

consulted the whole of these, *according to their dates*, he might have spared a great part of his censorial remarks. Let Mr. Ogilby consult the very first catalogue, and he will find, that most of his identifications of my so-called new species, with others recorded by authors, had been priorly indicated by myself. Let Mr. Ogilby have patience, and he will still find, that several of these species are really new. With regard to *Semnopithecus*, *Entellus*, *Papio Rhesus*, *Cercopithecus Radia-tus*, *Manis Macrourus*, *Cervus Equinus*, not I, but the late Mr Bennett, is answerable for the errors committed where such there be, as I have letters of his to prove: and so too, for the misappropriation in reference to *Felis Viverrinus*. Of that species, my specimens had reached London before Mr. Heath's, and been seen by Mr. Bennett, who had suggested to me the Viverrine likeness, which I was contending was confined to the head; when to my surprise, for Mr. Bennett was in general singularly fair and courteous, suddenly appeared the description of a novelty ascribed to Mr. Heath. Mr. Gray (apud Hardwicke) had meanwhile justly given the discovery of the species to me, though he retained Mr. Bennett's name for it; but as that name conveyed a false analogy, I have chosen to adhere to my own. In short, Mr. Ogilby's critique is rather too much like a comment on the well-known text, "Woe betide the local researcher, who presumes to judge of his own stores."

Valley of Nipal, Dec. 1841.

Proceedings of the Asiatic Society.

(Thursday Evening, 11th November, 1841.)

The Hon'ble Sir E. RYAN, President, in the Chair.

The Reverend WM. WINCHESTER, Chaplain of Berhampore, was proposed a Member by F. BEAUFORT, Esq. seconded by the Secretary.

Library and Museum.

Read the following Reports submitted by the Curator and Librarian.

The Curator's Report.

SIR,—My report for the month of October will be found to relate chiefly to a valuable donation of Quadruped and Bird skins, procured in the vicinity of Maulmain, which have been presented to the Society by Government, and to another collection of Bird skins from the Himalaya, for which we are indebted to the liberality of Dr. Spry, of the Bengal Medical Service.

The first of these collections contains six skins of Mammalia, pertaining to as many species, and 58 of Birds, which are referrible to 42 species. I have endeavoured to determine the whole series, and shall proceed to notice them in detail, adding such remarks as I conceive may be useful to students of Zoology in this country.

The Mammalia consist of two *Carnivora* and four *Rodentia*, which are as follow:—

1. *Urva cancrivora*, Hodgson, (Journal of the Asiatic Society of Bengal, 1837, p. 562,) or, more recently, *Mesobema cancrivora*, *ibid.* (Calcutta Journal of Natural History, No. 6, p. 214.)—The specimen has been mounted with considerable difficulty, from the unfortunately decayed condition of the skin, though the hair is uninjured, and its appearance now is fully as good as that of Museum specimens in general. I have also had its skull (which is quite perfect) taken out and cleaned. This, as noticed by Mr. Hodgson, is remarkable for having incomplete bony orbits, which is very rarely the case in the highly natural sub-family to which the animal strictly appertains, namely, the *Viverridæ Herpestidinæ*. I do not myself perceive any peculiar affinity which it is said to bear to the *Guline Mustelidæ*.

2. *Artictis Binturong*, Temminck ; *Ictides Ater*, Valenciennes; and a juvenile brown variety, probably the ordinary dress of the young animal, *I. albifrons*, F. Cuvier.—The latter has usually been regarded as the permanent female colouring of the species, but a very old and much injured specimen of the female Binturong in our Museum, which now that the present specimen has been received, I have had the skull and limb-bones taken from, though sufficient to illustrate the fact here stated is retained of its skin, is equally black with the mature male. The Maulmain specimen is little more than half-grown, and retains its deciduary canines: its colour is black, with a grizzled whitish visage, occasioned by each hair having a subterminal yellowish-white annulation, which is likewise the case, more sparingly, on the limbs; while the belly and basal part of the tail underneath are of a dull reddish white, more or less of which, I believe, is permanent; ears white-edged, but the lengthened hair on their posterior surface black. This specimen was also in very bad condition, being much torn and decayed, but the hair is nearly perfect. Its skull has

been taken out, and we have now, therefore, two examples illustrating different ages of the skull of this highly interesting genus. It pertains to the restricted division of *Plantigrada*, which have two true molars on each side of both jaws, posterior to the *carnassier*, or scissor-tooth, a distinction serving, with other characters, to separate them (as a different natural group) from the Badgers and allied forms, which latter, associated with the Weasels and their allies, form another, equally distinct, that might be termed *Subplantigrada*: these have but one true molar in each jaw, posterior to the scissor-tooth; which latter is merely the hindmost of the *false* molars, and, as such, is represented by a deciduary tooth in the young animal, which is never the case with *true* molars. There are some genera in which the scissor-tooth can scarcely be determined except by this test, and the Binturong is one of them. Both divisions here indicated are distinguished from all the other *Carnivora* (Cuv.) by the absence of a *cæcum coli*, wherein they resemble the greater number of *Insectivora* (Cuv.) The absence of a *cæcum* is, indeed, assigned by Baron Cuvier as a character common to the whole of his *Insectivora*; but M. M. Diard and Duvaucel had long previously to the publication of the 2d edition of the *Regne Animal*, noted the existence of this viscus in the genus *Tupaia*, Raffles;* (*Cladobates*, F. Cuv.; *Glisorex*, Blainville; *Hylogale*, Tem.) and Dr. Andrew Smith has recently figured and described the *cæcum* with the other viscera of his genus *Macroschelides* (or *Erinomys*, Blainv.; *Rhynomys*, Lichtenstein): it may be expected to exist likewise in the genus *Gymnura*, Vig. and Horsf. (or *Echinosorex*, Blainv.), and also in the little known genus *Eupleres* of Doyère, figured, not long ago, in the *Annales des Sciences Naturelles*. The restricted *Plantigrada* consist of seven genera, whereof one—the Bears (*Ursus*)—comprises numerous living as well as fossil species, the former of which are distributed over Europe, Asia, the great Malay Islands, the Atlas chain in North Africa, the Andes in South America, and all North America; a fossil species is likewise found in Brazil: of the other six, two are peculiar to Asia, and the rest to America. The former are—the Panda (*Ailurus*, Duvaucel), or ‘Wah’ of Nepâl, chiefly known to inhabit the eastern Himalayas; and the *Binturong* (*Arctictis*, Tem., *Ictides*, Valenciennes), which is also found in Nepâl, and thence southward to Malacca: the latter consist of the Raccoons, (*Procyon*, Storr); the Coati-mondis (*Nasua*, Storr); the Kinkajou (*Cercoleptes*, Illiger); and the Bassary (*Bassaris*, Lichtenstein). Two of them are stated to have prehensile tails, namely, the Kinkajou and the Binturong: in the former of these, however, this organ is prehensile only in a very slight degree, (insomuch that the term is quite inapplicable,) as I am enabled to state from personal observation, having seen a very tame Kinkajou loose in a room; this animal, as it clambered about the chairs, &c. merely pressed its tail occasionally and very slightly against whatever offered, stiffening it throughout its length in a slight downward curve, but never coiling it; but the Binturong, according to native accounts, twists its tail round a branch to give impetus to its spring, and then throws itself on its prey, generally Monkeys (whence its Burmese name of *Myouk kya*, or monkey tiger), and with it falls to the ground. Its head is said to be particularly hard, and that it cannot be killed by blows inflicted on it. “The present specimen,” which is the individual now presented to the Society, “had several blows inflicted on it with a heavy bamboo, but not apparently to its injury: it was shot at the summit of a tree; and the natives say, that this animal is generally seen upon

* Asiatic Researches, vol. xiv, p. 474.

trees, living in the jungles, where it is very seldom observed.”* The crania before me are by no means remarkable for solidity, and indeed that of the specimen referred to is fractured, doubtless from the blows mentioned; and it may be remarked that the tail of this creature has no naked space at its extremity, wherein it resembles those of the American Sajous (*Cebus*, Geoffroy). In the other genera of true *Plantigrada*, except the Bears which have scarcely any tail, this appendage is equally bushy throughout its length, and is always ringed with two shades of colour. Several of these animals have retractile claws, more or less so; as instanced in the Panda and Binturong, and in the Bassary. The last named elegant species has been erroneously approximated to *Parodaxurus*, among the *Viverridæ*, which family has no American representative. The Zoological Society possessed a living specimen at the time I left London, and as this genus is but very little known to most naturalists at present, I may be permitted to mention that it does resemble *Paradoxurus* not a little in external aspect, having the same elongated body, enabling it to spring from bough to bough with extreme lightness and agility, ruddered by its very bushy and squirrel-like tail. Its head resembles that of the Kinkajou, with the same Marten-like ears, and long extensible tongue, which latter is indeed common to the whole group, all of which are great devourers of honey and other sweets: but the Bassary would appear to be also highly predatory, and probably a good deal resembles the Martens in its habits. Its talons are very sharp and retractile; and the fur short and Lemur-like, as in the Kinkajou: colour greyish with a barred tail. What specimens have been obtained have all been brought from Mexico. Such is a slight survey of the group to which the Binturong belongs, and to which certain fossils are likewise referrible, as that figured in Pl. 150, figs. 2, 3, and 4, of the *Ossements Fossiles* of Baron Cuvier. The *Ictide Dorée* of Mons. F. Cuvier is a veritable *Paradoxurus*.

3. *Pteromys petaurista*, Auct:—being the first well authenticated example of this large dark species which I have seen from the eastward of the Bay of Bengal. It may, therefore, rather than *Pt. nitidus*, be the great Tenasserim species mentioned by the late Dr. Helfer; but it is probable that both inhabit the same forests. The *Pt. Oral* of Lieut. Tickell, elaborately described in the *Calcutta Journal of Natural History*, No. 7, p. 401, would appear to be no other than *Pt. petaurista*.

4. *Sciurus bicolor*, Sparman.—A very fine specimen. Of this animal, which Dr. McClelland procured examples of in Assam, we are informed by Dr. Horsfield (in *Proc. Zool. Soc.*, for 1839, p. 151), that “individuals agreeing in all particulars with the Assamese specimens have been observed in other parts of India by Dr. Francis (Buchanan) Hamilton and by Dr. Finlayson. The latter forwarded several specimens to the Museum at the India House. The specific character originally constructed by Sparman, and subsequently adopted by all systematic writers, defines accurately the animal as described by Dr. Hamilton and by Dr. McClelland. Schreber’s figure also agrees with the same; while the animal from Java (represented in Horsfield’s *Zool. Res.*, and indicated as a variety in Fischer’s *Synopsis Mammalium*,) appears to differ from the continental specimens by the variations to which it is subject. It remains, therefore, for further research and observation to determine whether these two varieties may not be specifically distinct, and whether

* Captain McLeod, in *Calcutta Journal of Natural History*, No. 7, p. 458, from information supplied by the Rev. Mr. Barb.

the name of *Assamensis* proposed by Dr. McClelland should not henceforth be applied to the species observed in continental India by himself, and by Hamilton and Finlayson." The present species is nearly allied to *Sc. maximus*, but differs from that animal and its Javanese analogue *Sc. Leschenaultii*, among other respects, by the constancy of its colouring; Dr. McClelland remarking that the description of it which he took was derived from seven or eight specimens, and that among the various individuals he had seen there appeared to be no difference. "All the upper parts are deep and glossy reddish-black, the cheeks and under-parts whitish tinged with fulvous, with two dark spots on the chin. Body fifteen, tail sixteen inches long." Our Museum contains a fine series illustrative of the variations of colour of *Sc. maximus*; and the skulls of both the present and the foregoing species (*Pteromys petaurista*) have been taken out, for purposes of comparison with their proximate allies. That of *Sc. bicolor* is much smaller, and otherwise differs considerably from the skull of *Sc. maximus*.

5. *Sciurus* ——— ?—Undetermined, but, I believe, a species which I have seen before, in England. Dr. Spry possesses a living specimen of it from Arracan. Length 10 or 11 inches, the tail, with its hair, 1 foot or nearly so; ears slightly tufted with whitish, denoting the hyemal dress. Colour grizzled fulvous-brown, purer fulvous on the sides of the neck, and less so on the head and croup; fore-limbs and hind feet ashy, the tail slender and black-tipped, and the under-parts and inside of the limbs whitish-grey; whiskers black and strong. This species is very common along the Tenasserim coast.

6. *Rhizomys cinereus*, McClelland, (Calcutta Journal of Natural History, No. 7, p. 496,) genus *Nyctocleptes* of Temminck.—The researches of naturalists in this part of the world are fast bringing to light additional species of this curious genus, which, till lately, was only known to contain the *Rh. Sumatrensis*, Gray, (or *Mus Sumatrensis*, Raffles,* *Spalax Javanus*, Cuvier, and *Nyctocleptes*—?, Temminck,) and the *Rh. Sinensis*, well figured in one of the late Major General Hardwicke's drawings, edited and named by Mr. Gray. The latter species has been discovered to inhabit the Phillippine Islands by Mr. Cumming—(vide *Proc. Zool. Soc.*, 1840, p. 62.) A third has been made known by Mr. Hodgson as an inhabitant of Nepâl (*Rh. badius*, Hodgson); and the present species is described to me by Mr. Barb to be the smaller of two inhabiting the Tenasserim provinces. Moreover, two if not three species, according to Dr. McClelland, are contained in a zoological collection of much interest, recently made in Assam by Mr. H. Walker, and which is now under that gentleman's investigation. An additional interesting notice of the Nepâlese species has been published by Mr. Hodgson (in Calcutta Journal of Natural History, No. 7, p. 411). The fact there stated of this creature's tameness when first caught, and not offering to bite with its formidable front-teeth, is observable in even most other Rodents, though the genera *Mus* and *Sciurus* form conspicuous exceptions to it: the large Water Vole of Europe may be handled with perfect impunity. With respect to the food of the species of *Rhizomys*, which is known to consist of roots, and especially those of bamboo, I would call attention to an observation of the Rev.

* Dr. McClelland inclines to doubt the identification of Mr. Gray's animal with that of Sir Stamford Raffles, and which is figured in one of the late Colonel Farquarson's drawings, preserved in the Museum of the London Asiatic Society, where I have seen it. vide *Loc. Cit.*

Mr. Bree, relative to the common Rat (*Mus decumanus*), to suggest the probability of the same remarkable mode of feeding being resorted to in the present instance, which the great power of the jaws and strength of the gnawing teeth seem to render very likely. Mr. Bree describes the attacks of the Rats upon his "young oaks in a plantation near a brook and small pond. They gnaw the tree off just below the ground; sometimes nearly as level as if it had been cut with a saw. Young trees nearly as thick as my wrist," he states, "have been served in this way; and I have been quite astonished how the Rats could cut them through so completely. The fact is, the Rat begins his operations underground, and eats upwards as far as he finds the wood soft enough for his purpose, which is just below the surface: the consequence is, that the tree will often remain erect, and appear to the eye as if nothing had happened to it; but of course it throws out no leaves in the spring, and, on taking hold of it, you find it loose, and ready to come up with a touch."* The same has been observed of young willows growing in a somewhat marshy soil, and been referred, as I believe erroneously, to the operations of the Water Vole. According to the information supplied to Captain McLeod by Mr. Barb, the *Pouè* (*Rhizomys cinereus*) is an animal rarely seen, and is found in the more hilly parts of the country. The Burmans eat the animal when they can catch it. It burrows very rapidly, and spends the day time in holes, living on the roots of the bamboo generally, but towards night-fall it comes out and amuses itself by cutting the bamboo down, which it does very expeditiously. It does not take to the water at all."† Mr. Hodgson was informed that the Nepalese species constructed burrows under the roots of trees or shrubs, and that they may be taken almost as easily as a domestic animal, from their extraordinary boldness or apathy. An interesting notice follows, of an individual which that naturalist possessed alive.

Of the foregoing six Quadrupeds, the *Urva*, the two Squirrels, and the *Rhizomys*, are new to our Museum; the *Pteromys* was represented only by an imperfect skin, noticed in my last report; and the Binturong is equally acceptable, as replacing, till we can get a still better one, the very old and shabby specimen already mentioned.

Of Birds, there are two species of the restricted order *Scansores*, or Parrots; viz.

1. *Palæornis Pondicerianus*, Vigors, or *Psittacus mystaceus* and *bimaculatus*, Shaw; which, though procurable in any number in Calcutta, is new to our Museum; and

2. *Psittacula vernalis*, Swainson.—The small Crimson-rumped Lorikeet, which is also a common bird in India. Both these species, and the former especially, as I am informed by Mr. Barb, are very common on the Tenasserim coast, where also are found four other species of *Palæornis*, namely, *P. Alexandri*, *torquatus*, *Bengalensis*, and *flavitorquis*.

The only Raptorial species sent is—

3. *Athene cuculoides*; *Noctua cuculoides*, Vigors.—Which is also very common, and much persecuted, and even frequently killed by the Crows (*Corvus splendens*, Vieillot, or better named *C. impudicus*, Buchanan; the common Crow of India).

Of the order *Insectores*, and first great division of it—*Heterogenes*, I find, among the *Syndactyli*, technically so styled, two species of *Buceridæ*, three of *Halcyonidæ*, and two of *Meropidæ*, viz.

* Gardener's Magazine, vol. vii. p. 235, and Magazine of Natural History, vol. vii. p. 456.

† Calcutta Journal of Natural History, No. 7, p. 457.

‡ Ibid. p. 411.

4. *Buceros ruficollis*, Vieillot.—Mr. Barb assures me, that there are two races, or perhaps species, of this Hornbill, which differ only in the colour of the naked skin of the throat and around the eyes, which in one is of a beautiful blue, and in the other an equally rich yellow. Both are very common, associating in flocks of a dozen or twenty birds, but the two do not mingle in the same flock. The *B. Nipalensis* (Hodgson) was not recognised by Mr. Barb as an inhabitant of Tenasserim.

5. *B. leucogaster* ? Nobis, n. s. ? Length about two feet, of wing from bend $9\frac{1}{2}$ inches, tail the same ; beak $3\frac{1}{2}$ in. long, and, with casque, 2 inches deep ; the latter sub-carinated, and narrowing and diminishing anteriorly to where it terminates, but little abruptly, beyond the middle of the upper mandible, as if a young bird (which Mr. Barb assures me it is not). All the upper parts wholly black glossed with green, except the tips of the wing-primaries and secondaries, and of the tail feathers, exclusive of the uropygial pair, which are white ; belly and thighs also white, as is likewise the inside of the shoulders of the wings : coronal and occipital feathers elongated. Beak yellowish white ; and tarse greenish. This species associates in large flocks, and is even more common than the last. A still smaller black species, with a similar casque, and the common Indian *B. Malabaricus*, are stated by Mr. Barb to be also common in Tenasserim ; while the great *B. Homrai*, Hodgson, is likewise found there, but more sparingly, and differs from the rest in never flocking but keeping in pairs, and avoiding human habitations. The *B. Rhinoceros* was not recognised by Mr. Barb as an inhabitant of Tenasserim.

6. *Alcedo Bengalensis*, an adult and two young specimens.—This common Indian species is contained in a collection made by Dr. Cantor in Chusan. It abounds in Tenasserim.

7. *Halcyon Capensis*.

8. *H.* ——— ?—The Goorial of the Sunderbunds of Bengal.

9. *H. Coromandus*, *Alcedo Coromandus*, Sonnerat.—The *H. atricapillus* and *H. Smyrnensis* are likewise recognised by Mr. Barb, as being, with the three former species, common in Tenasserim ; and all are stated by him to be very piscivorous, which is a fact not generally known of the restricted Halcyons. *H. rudis*, was observed by Mr. Barb at Rangoon.

10. *Coracias affinis*, McClelland and Horsfield (*Proc. Zool. Soc.*, 1839, p. 164.)—I am informed that this bird is not unfrequent in Bengal.

11. *Bucia Athertonii* : *B. Nipalensis*, Hodgson ; *Nyctiornis Athertonii*, Swainson ; *Merops Athertonii*, Jardine and Selby ; *M. cyanopterus*, Jerdon (Madras Journal, No. 27, p. 228.)—Both this species and *B. amictus* are stated by Mr. Barb to occur, though rarely, on the Tenasserim coast. The latter is, I believe, more frequent in the Malay peninsula. The *Coracias Indica*, *Merops Indicus*, and *M. Sumatranus*, are also recognised by Mr. Barb as inhabitants of Tenasserim. *Upupa Epops* is very abundant.

Among the *Zygodactyli*, technically so denominated, I find in the collection

12. *Bucco Indicus* and *rubricapillus*, Latham, *B. Phillippensis* and *flavicollis*, Vieillot. A very abundant species in Bengal, and, I believe, throughout the Indian Peninsula. It is equally common in Tenasserim, where, however, the *B. cyanops*, so plentiful in Bengal, was not observed by Mr. Barb.

13. *Picus occipitalis*, Vigors.

14. *P. squamatus*, Vigors; *P. dimidiatus*, Gray, not of Temminck.—Immature plumage, having the crown and occiput more scarlet than in the adult, the breast a little streaky, and the under-parts marked but obscurely. This and the preceding species, which are nearly allied to the two green Woodpeckers of Europe, are included with them in the subgeneric division *Gecinus* of Boié.

15. *P. tiga*, Horsfield, *Chrysonotus tridactylus*, Swainson.—The Indian Three-toed Woodpecker. This bird only differs in plumage from the *P. Shorii*, Vigors, as figured in Gould's Century, by wanting the defined brown markings on the throat and fore neck; and as there is some tinge of the same about the throat, and on the sides of the neck, of the present specimen, I incline to consider them identical. This three-toed species is not particularly allied to the three-toed Woodpeckers of the North, which essentially pertain to quite a different section of the genus—the *Dendrocopus*, Swainson; but it closely approximates to the common *P. Bengalensis*, which has a minute inner back toe, and is intermediate in plumage to that species and another and larger Woodpecker in our collection, (the *P. Sultanus*, Hodgson,) which has a proportionately much larger beak, and a full-sized fourth toe; from the latter, the only marked difference of plumage consists in the three-toed species having the hind neck black (as in *P. Bengalensis*,) instead of white; while from the other it differs more conspicuously by its crimson rump, and the uniform golden orange colour of the wings externally. All three are stated by Mr. Barb to inhabit the Tenasserim provinces.

16. *P. badius*, Raffles; *P. brachyurus*, Vieillot and Wagler; *P. rufus*, Gray, not of Wagler.

17. *P. (Meiglyptes*, Sw.) *poioccephalus*, Temminck: an adult male and young female specimen. Common in Tenasserim, as are all the other Woodpeckers which have been mentioned.

18. *Oxylophus* — ?—Undetermined. I believe, a well known species, but the name of which I have not been able to ascertain. Length 17 inch, of wing from bend $6\frac{1}{2}$ inches, and tail 10 inches. Beak $1\frac{1}{8}$ inch from forehead, and tarse posteriorly 1 inch. Coronal feathers elongated. Upper parts blackish-brown having a green shine, except a half collar of white at the back of the neck; under-parts white, tinged with rufous on the throat, fore-neck, and under surface of the wings anteriorly; lower tail-coverts dusky-black; primary and secondary quills and their coverts deep ferrugineous, the tail feathers slightly tipped with whitish. Beak blackish horn-colour; and legs greenish plumbeous. This bird is common in Tenasserim, where the *O. edolius*, which is numerous in Bengal, was not observed by Mr. Barb. It would appear to be nearly allied to *O. Coromandus*.

19. *Phœnicophæus longicaudatus* ? Nobis, *n. s* ?—Length $23\frac{1}{2}$ inches, of wing from bend 6 inches, and middle tail feathers $15\frac{1}{2}$ inches, the outermost $5\frac{1}{4}$ inches, and the rest evenly graduating. Beak $1\frac{1}{8}$ inch from forehead, and tarse posteriorly $1\frac{1}{4}$ inch. General colour dark greenish-grey; the wings and tail shining dark-green, with a white tip to each tail-feather; front of the neck and breast paler, passing into whitish on the throat and immediately around the naked space encircling the eye, these whitish feathers having dark shafts, which terminate in a slightly prolonged hair-like bristle; small anterior portion of the lores black. Beak bright-green, and legs dusky. A common species in Tenasserim, and always seen in pairs. The *Centropus pyrrhopterus* is also very common there, as in India generally.

Of *Heterodactyli*, this collection contains only

20. *Trogon Malabaricus*, Gould, *Tr. fasciatus*, Gmelin, *Tr. Kasumba*, Raffles, *Tr. Blonda*, Tem.—An immature male, being the first specimen of this gorgeous genus in our Museum. It is remarkable that the Trogons differ from all other yoke-footed birds (or which have two toes directed forwards and two backwards) in the circumstance of the ordinary inner fore toe being reversed, instead of the outer; in consequence of which, that which corresponds to the middle front toe of the generality of the class (or such as have three toes directed forwards) becomes the inner of the two anteriorly directed toes, instead of the outer as usual, and the ordinary back toe becomes the outer, instead of the inner, of those behind. The *Trogon Malabaricus* is common in Tenasserim.

Among the *Cantrices*, or second grand division of *Insesores* (which have the general organization of singing birds, whether or not they happen to sing), the following species occur:—

21. *Pica (Dendrocitta) vagabunda*, Gould.—Three young specimens. A common species, as in India; but *D. Sinensis* not recognized.

22. *Ianthocincla leucolophos*?, *var.*; or perhaps a very closely allied species; differing only in having the whole back, wings, sides, vent, and lower tail-coverts ferruginous, which colour is usually confined to the nape and sides of the neck, passing downward to cross the breast; while the white of the under parts, also, of the present bird, instead of abruptly terminating at the lower part of the breast, is continued down the middle of the belly. Also common, occurring in considerable flocks.

23. *Kitta venatorius*, Gray and Hardwicke.—Two adult and three young specimens: considered to be a rare species. The irides are bright red.

24. *Dicrurus retifer*, Vieillot.—Three specimens, but moulting their long exterior tail feathers. This shewy bird is abundant in Tenasserim, as are also *D. balicassius*, a smaller species nearly allied to this, and *D. viridescens*? (*Edolius viridescens*, Gould); but the elegant *D. krishna*, which I observe to be common in the vicinity of Calcutta, was unknown to Mr. Barb.

25. *Lamprotornis chalibeus*, Horsfield.—Common.

26. *Graucalus Papuensis*.

27. *Eurylaimus nasutus*, Tem.; *Cymbirhynchus nasutus*, Vigors.—Two specimens; being the only species of *Eurylaimus* observed by Mr. Barb. The beak and eyes are very beautiful blue, the former fading within a day or two after death. It is common in watery situations, and suspends its nearly globular nest, which is constructed of small twigs, from the branches of trees growing directly out of the water; the eggs are four in number, and pale spotless blue.

28. *Muscipeta Indica*, Stephens, *M. castanea*, Temminck.—Female.

29. *Muscicapa cærulea*, Vieillot, *M. occipitalis*, Vigors; female: which is the *M. cæruleocephala*, Sykes.

30. *Pitta brachyura*, Auct.—Two specimens.

31. *P. melanocephala*, Wagler.

32. *P. gigas*, Temminck.—Apparently in nestling plumage. All these birds are common in Tenasserim.

33. *Oriolus melanocephalus*, Linn.—Three specimens.

34. *O. Chinensis*, Gmelin.—Two specimens.—

35. *Chloropsis Malabaricus*, Jardine and Selby.

36. *Cinnyris Vigorsii*, Sykes.—Being a new locality, I believe, for this beautiful little species. It is common in Tenasserim.

37. *Anthreptes rectirostris* : *Cinnyris rectirostris*, auct; *C. elegans*, Vieillot.

The remainder consist of a Pigeon, a Jungle Fowl, two Storks, and a Duck; viz.

38. *Carpophaga aenea*: besides which, the *Columbæ (Turtur) Javanica* and *tigrina*, and *Vinago bincta* (Jerdon) and *V. sphenura*, are recognised by Mr. Barb as inhabitants of the same region.

39. *Gallus pseudhermaphroditus*, Nobis, n. s. ?—A very singular bird, which, if I was not positively assured was a male in normal plumage, I should have suspected to be either an individual of mingled sex, or possibly an aged male; for that it is not a female in partially masculine attire is evident from the size of its comb and wattles, and especially of its spurs. Size of an English game cock, or larger than the male *G. Bankivus*, having much stouter legs, the spurs of which are $1\frac{1}{2}$ inch long; comb and wattles as in the *G. Bankivus*, but the former more entire towards the front (possibly a mere individual diversity): the tail is that of a cock bird of this genus, but scarcely more developed than in the *Euplocomi* (as *Eu. albo cristatus*); in other respects the plumage is altogether that of an ordinary brown hen, having a redder cast than in the female *G. Bankivus*, especially on the wings; tail coloured as in an ordinary male. Length about 2 feet, of which the middle tail feathers occupy 10 inches, wing from bend 9 inches, and tarse behind, to back toe, $2\frac{3}{4}$ inches. I am informed that this species is never clad in the usual bright plumage of the other male birds of its genus.

40. *Ciconia leucocephala*, *Ardea leucocephala*, Auctorum; *Ciconia umbellata*, Wagler.

41. *C. nudifrons*, Jerdon.—The Bald-fronted Adjutant, which I observe to associate with the common Bengal species about Calcutta, where, however, it is comparatively rare. The present specimen is young, and has some lengthened occipital feathers, which seem to disappear gradually with age. Our Museum contains a very fine specimen of the adult of this species.

42. *Microcygna girra*.

Besides these 42 species sent, 14 of which are new to our Museum, and such as have been mentioned with their congeners as inhabitants of the Tenasserim provinces, the following have been recognised in our Museum by Mr. Barb, as species more or less common in the same region: *Milvus Cheele*, *Cercus melanoleucos*, *Gracula religiosa*, *Sturnus contra*, *Pastor cinereus* (Jerdon), *P. tristis*, *P. cristatellus*, *Parus monticolus*, *Copsychus saularis*, *C. macrourus*, *Phœnicura fuliginosa*, *Cryptolopha poiocephala*, *Rhipidura Albofrontata*, *Spermestes melanocephalus*, *Tantalus leucocephalus*, *Ibis papillosus*, *Pluvianus Goensis*, *Rhynchops flavirostris*, and *Dendrocygnus awsuree*.

I now pass to the Himalayan collection of Bird skins, from which Dr. Spry has kindly permitted me to select what species were new to the Museum, and for which I have exchanged certain duplicates that were not required. Our acquisitions this way consist of

1. *Palæornis schisticeps*? mentioned in the catalogue of Dr. Royle's birds: size of *P. torquatus*, and nearly allied to *P. Bengalensis*, but having a dull lavender-coloured

head, and black chin and nuchal ring bordering the lavender tint. General colour of the upper parts vivid green, a little paler underneath, and not yellowish as in *P. Bengalensis*, but tinged about the nape with verditer; maroon wing-spot as in *P. Bengalensis*; and tail wholly yellow underneath, the two middle feathers green above near the base, then bright blue, and the terminal third yellow; the other tail feathers all yellow on the inner web and tip, having the rest of the outer web green. Upper mandible bright vermillion as far as the notch, its tip and the whole lower mandible yellowish-white; feet as usual. Length 16 inches, of which the tail occupies $9\frac{1}{2}$ inches, its middle pair of feathers reaching $2\frac{3}{4}$ inches beyond the next pair; wing from bend $6\frac{1}{4}$ inches, and tarse $\frac{1}{4}$ inch.

2. *Picus squamatus*.—Female; having the crown and nape black instead of red.

3. *P. Himalayanus*, Jardine and Selby; an immature female.

4. *P. brunnifrons*, Gould and Vigors. Male and female. The collection contained four specimens of this species.

5. *Myophonus Temminckii*.—One of seven specimens.

6. *Turdus viscivorus*.—The European Missel Thrush, one of three specimens, and selected for the purpose of shewing a veritable Himalayan example of this well known bird.

7. *Petrocincla erythrogastra*; *Turdus erythrogaster*, Vigors.—A bad specimen, but we had previously only the female of this fine species, of which the present collection contains also an example.

8. *Orocetes cinclorhyncha*, G. Gray.—Examples of the summer and winter dress of this bird, selected from ten specimens; the whole of which according in their plumage, it may be presumed that there is no sexual diversity of colouring, as might be suspected from its near affinity to the Redstarts. The only seasonal difference consists in the feathers being slightly margined in winter with brownish on the back, and the blue coronal feathers with dusky. The Museum contains an example of this bird in nestling plumage.

9. *Cinclus Pallasii*, Auct.—The Himalayan Dipper, adult and young. A welcome addition to our collection, but the young bird especially is in very unsatisfactory condition.

10. *Enicura maculata*. One of three specimens, and selected from its appearing to present the opposite sex to that previously in the Museum.

11. *Muscipeta paradisea*. Female. A bad specimen, but which will serve to fill the place of this species until better examples of both sexes can be procured.

12. *Lanius erythronotus*.—One of two specimens.

13. *L. Hardwickii*.—Both these species were labelled "Indian Mocking bird." Several of the Shrikes have been frequently stated to repeat the notes of other birds with much facility.

14. *Coccothraustes icterioides*. Female. The sombre plumage of this sex was wanting in our Museum, where, however, there is a fine male, and the present collection contains two other males.

15. *Columba leuconota*, Vigors.

16. *Lophophorus Impeyanus*.—Male and female; the collection containing five females and four males of this resplendent bird.

17. *Phasianus Wallichii*: *Lophophorus Wallichii*, Hardwicke; *Ph. Stacei*, Vigors and Gould.—Male and female; of which species, four males and two females were sent.

The remainder of this collection consists of *Alcedo Bengalensis*, *Bucco grandis* (2), *Pica* (*Cyanocorax*) *erythrorhynchos* (2), *P.* (*Dendrocitta*) *Sinensis*, *Garrulus gularis* (5), *Nucifraga hemispila* (3), *Ianthocincla variegata*, *Oriolus aureus*, *Muscicapa cærulea*, *Phænicornis brevirostris* (3), *Euplocomus albocristatus* (2), *Eupl. Pucrasia*, *Tragopan Hastingsii*, *Francolinus vulgaris* (3), and *Perdix Chukar* (2).

I have also to acknowledge the donation of a fresh Chinese Lory (*Lorius Sinensis*) from P. Humphrey, Esq., and of a living specimen of a Hawk (*Elanus melanopterus*), in immature plumage, from W. Frith, Esq.

The following species of Birds have been procured in the neighbourhood :—

1. *Milvus Cheele*.—Female.
2. *Strix flammea*.—Male.
3. *Halcyon* —?—The Goorial, male.
4. *Coracias Indica*.—Male.
5. *Merops Indicus*.—Male.
6. *Bucco cyanops*.—Two specimens, males.
7. *B. Indicus*. Two specimens, males.
8. *Picus Bengalensis*.—Male.
9. *P. Macei*.—Male.
10. *Oxylophus edolius*.—First plumage.
11. *Dicrurus Crishna*. (*Edolius Crishua*, Gould). Female.
12. *Pastor cinereus* (Jerdon).—Male and female.
13. *Iora tiphia*.—Young male.
14. *Lanius Collurio*? *verus*.—Young male.
15. *Hæmatornis Caffer*.—Two males.
16. *Copsychus Saularis*.—Male.
17. *Geocichla citrina*.—Male.
18. *Oriolus melanocephalus*.—Two males and a female, illustrating different states of plumage.
19. *O.* —? n. s.?—Female; having no black whatever about the visage. This specimen is now alive in a cage.
20. *Ceblepyris melaschistos*; *Volvocivora melaschistos*, Hodgson: female.
21. *Cinnyris sola*.—Male, female, and young.

All the above (save the living Oriole) have been examined internally, the sternal apparatus of the greater number prepared, and minute descriptions have been taken of them in the recent state, noting the fugitive colours of the feet and other naked parts, that of the iris, &c. On dissecting the Barbets, I found a very close approximation in general structure to the Toucans of South America, much more than to the Woodpeckers, in immediate proximity to which latter the Barbets have been always arranged: excepting the bill and tongue, the internal conformation of the Barbets seems to be altogether that of the Toucan, even to the singular character of the imperfection of the clavicles, which do not join to form a *furcula* (or 'merry thought') as in other birds, but exist as small dagger-shaped bones, about half their ordinary length; nor do the bill and tongue of the Barbets possess any resemblance to those of the Woodpeckers, as obvious enough in the instance of the former, while the tongue is merely a flattened lamina of the ordinary shape and size, a little furcate at the tip, being more distinctly so in *B. cyanops*, and less noticeably in the small *B. In-*

dicus. The African genus *Indicator*,* on the other hand, which has been currently classed with the Cuckoos, appertains strictly to the natural family *Picidæ*. The only other birds I know of, wherein the clavicles do not join and form a *furcula*, besides the *Struthionidæ*, properly so called, in which they are curiously modified, are the Touracoes (*Corythaix*) of Africa (and doubtless the allied genera *Musophaga*, *Chizæris*, and *Colius*), in three different species of which I have found the clavicles to be separate, though all but joined; and various *Psittacidæ*, in which they are altogether wanting. They vary in proportionate length in different species of Toucan (*Rhamphastos*), but have been figured by l'Herminier as united in the closely allied *Pteroglossus Aricari*.

In the class of Mammalia, we are indebted to Lieutenant Tickell for two fine pairs of Deer-antlers, belonging respectively to the Sambur (*Cervus Hippelaphus*), and Axis (*C. Axis*).

In that of Reptiles, I have procured three specimens respectively of two species of Snake, and some examples of an *Anolis* common in the neighbourhood. The former are—

Psammophis cerasogaster, Cantor:—which is considered by that naturalist rather an uncommon species, and is new to the Museum; and

Tropidonotus dora, Cantor; *Dora* of Russell; *Coluber Dora*, Daudin.

Osteology.—The skeleton of the Rhinoceros, noticed in my previous report, has been remounted, and is again in its place. It is unfortunately deficient in the digital bones of all four extremities, in the sternal pieces, the penultimate pair of ribs, and one of the diminutive last pair. We possess, however, a skeleton foot of a Rhinoceros, presented to the Society by Dr. Pearson.

A skeleton of a Bat, *Scotophilus castaneus*, has also been prepared and set up, and also the skulls of the following species of *Vespertilionidæ*:—

Scotophilus castaneus.

Taphozous longimanus.

T. brevicaudus, Nobis, n. s.

Megaderma lyra, and

Dysopus plicatus (?).

Also skulls of

Canis aureus.

Vulpes montanus.

Urva Nipalensis.

Paradoxurus typus.

Arctictis Binturong.—Two specimens.

Pteromys petaurista.

Sciurus maximus.

Sciurus bicolor.

Sciurus—? Undetermined.

Mus—? Undetermined.

Gerbillus Indicus.

Georychus fuscocapillus, Nobis, n. s.

* Since writing this, I have met with a Himalayan species of true *Honeyguide*—*Indicator xanthonotus*, Nobis.

The skeleton of the Hoolock, or White-browed Gibbon, is prepared, and quite ready for mounting, as also that of a Crow (*Corvus splendens*); and skeletons of two species of Barbet, of a Snipe (*Scolopax heterura*), and of *Cinnyris Sola*, are in course of preparation. In addition to the sternal apparatus of most of the birds already mentioned, as having been procured in the recent state, we are indebted to Mr. Bouchez, for that of a Monaul (*Lophophorus Impeyanus*), that of a rare Hawk (*Hyptiopus lophotes*), and of one of the Australian broad-tailed Parroquets (*Platycercus eximius*).

In the Botanical Department of the Museum, I have nothing to report,

The Librarian's Report.

SIR,—The report I have the honour to submit to the Committee for the months of September and October is as follows:—

I received on the 27th September 23 gems from the Secretary, which were deposited in the medal cabinet.

Almost all the books in bad condition, a list of which I sometime ago laid before the Committee, have been rebound or repaired.

Though the expence incurred is great, the preservation of so many valuable works for the use of the Members of the Society and the community at large, will be more than adequate compensation.

A great number of duplicates have been selected from the shelves. Should it appear desirable to the Committee, these might be sold or exchanged for others, and as many of them are valuable books, perhaps the Members of the Society might wish to take some of them and give others in their stead.

The classification of the catalogue has been completed in the month of September, a copy of which is nearly ready for the print, and the arrangement of the library has been also finished.

I add a paper containing a general view of the classification of the catalogue.

The classification was, on the whole, made according to the plan I had the pleasure of proposing to the Committee. Such deviations from it only were thought advisable which bore a stricter correspondence with the principles according to which the classification was framed; and I may here mention it generally, that in the progress of the arrangement those principles were more and more rigidly adhered to, as this was found not only in more accordance with the natural divisions of science, but likewise better adapted to satisfy the demands of convenience.

The alterations alluded to are chiefly the following:—

There are at present only two main divisions, one containing the classic literature, the other that of the modern languages.

The science of medicine has found its more congenial place at the end of the natural sciences, instead of being connected with the three first divisions.

An alphabetical list of the titles of the books and of the names of the authors will be added to the catalogue, so that in finding the books every facility will be afforded to those who wish to avail themselves of the advantages of the library.

With regard to the collection I would remark, that, as it has been made mostly by valuable donations from generous individuals desirous of advancing the interests of the Society, no arrangement has been made to obtain all the standard works relating to each branch of knowledge, so that there are necessarily many deficiencies in the libra-

ry, which it seems desirable to supply. It would perhaps be well first to complete those divisions of the library which relate to natural science in general, and likewise those which refer to the history, civilization, languages, &c. of Asia.

I beg to submit to the Committee, if it be desirable, that all the books at present out, should be returned, at least for a short period, as the arrangement of the library cannot be completed till their titles and contents are ascertained. At the same time I would ask, if it be not advisable to call in the books once a year for the space of five or six days, that it may be known, whether they require repairing or any of them have been lost.

2d November, 1841.

I have the honor to be, Sir,

Your most obedient servant,

E. ROER.

Ordered,—That the three propositions,

1st. That the duplicate copies selected be either sold or exchanged;

2d. That the books now lent out be returned for a short time; and

3d. That the books be called in once a year for examination, submitted by the Librarian, be referred to the Committee of Papers.

A.

CLASSIC LITERATURE.

A. Greek Literature.

1. Philosophy.

2. History.

3. Geography.

4. Miscellaneous.

B. Roman Literature.

B.

Modern Literature, from the commencement of the Christian era to the present age.

I. Theology.

A. Polytheism.

a. Special forms of Polytheism.

1. Religion of Egypt.

2. ——— of the Greeks.

3. ——— of Zoroaster.

4. Brahmanism.

5. Buddhism.

6. Religion of Confucius.

b. Polytheism in general.

B. Monotheism.

a. Judaism.

b. Christianity.

1. Holy Scriptures and parts.

2. Biblical Criticism and Interpretation.

3. History of the Church.

4. Miscellaneous Works.

c. Mahommedanism.

II. Law and Jurisprudence.

- III. Philosophy.
- IV. Mathematics.
- V. Natural Sciences.
- A. Natural Science in general.
 - a. History.
 - b. Journals and Cyclopædical Works.
- B. Branches of Natural Science.
 - a. Natural Philosophy.
 - 1. Natural Philosophy in general.
 - 2. The branches of Natural Philosophy.
- A. Pneumatics.
- B. Hydrostatics.
 - j. Crystallography.
- 8. Sound.
 - r. Heat.
- y. Light.
- y. Electricity.
 - a. Magnetism.
 - b. Astronomy.
 - c. Geology.
 - d. Chemistry.
 - e. Natural History, and Natural History in general.
 - f. Branches of Natural History.
 - 1. Mineralogy.
 - 2. Botany.
 - 3. Zoology.
 - a. Zoology in general.
 - b. Branches of Zoology.
 - f. Anatomy.
 - g. Physiology.
 - h. Medical Science.
 - 1. History of Medicine.
 - 2. Pathology.
 - 3. Therapeutics.
 - 4. Materia Medica.
- VI. Applications and Arts.
- VII. Historic Science.
 - A. History.
 - a. General History.
 - 1. Chronology, Dictionaries, Journals, etc
 - 2. Universal History.
 - b. Special History.
 - 1 Of Antiquity.
 - {2. Of the Asiatic Empires.
 - B. Of Greece.
 - j. Of Rome.

- r. Of the Middle Ages and of Modern Times.
 - A. Of the Occidental Empires.
 - B. Of the Oriental Empires.
 - a. General History of the East.
 - b. Special History of the East.
 - Of the Huns.
 - Of the Mohammedan Empires.
 - 1. Of the Arabs.
 - 2. Of the Moguls.
 - 3. Of the Sultauns of Egypt.
 - 4. Of the Turks.
 - 5. Of Persia.
 - 6. Of Hindoostan.
 - 7. Of China and Japan.
 - C. Of America.
 - D. Of Africa.
 - B. Biography.
 - C. Voyages and Travels.
 - A. History of Travels, Voyages round the World, and Collections of Travels.
 - B. Travels in various parts of the World.
 - a. Travels in Europe.
 - 1. To various parts in Europe.
 - 2. To special parts of Europe.
 - b. Travels in Asia.
 - 1. Travels in Asia in general.
 - 2. Travels in Western Asia.
 - 3. Travels in Central Asia.
 - 4. Travels in Eastern Asia.
 - S. Travels in India, and Voyages to India.
 - c. Travels in Africa.
 - d. Travels in America.
 - e. Travels to the Polynesian Ocean.
 - C. Geography and Statistics.
 - a. General Geography.
 - b. Special Geography.
 - 1. Geography of Europe.
 - 2. ——— of Asia.
 - 3. ——— of Africa.
 - 4. ——— of America.
 - 5. ——— of Polynesia.
 - E. Archæology and Antiquities.
- VIII. Languages.
- A. Grammar.
 - a. Comparative Grammar.
 - 1. Grammar of European Languages.
 - 2. Grammar of Oriental Languages.

- d. Of the Semitic Languages.
 - B. Caucasian Languages.
Of Indian Languages.
 - 1. Of the Sanscrit.
 - 2. Of the Pali.
 - 3. Of the Modern Indian Languages.
 - S. Of the Chinese Language.
 - B. Dictionaries.
 - C. Critics and Interpretations.
 - D. Literature.
 - E. Catalogues.
 - IX. Miscellaneous Works.
 - A. Works.
 - B. Journals, Encyclopædias, etc.
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Read two letters, dated the 29th September and 20th October last, from Mr. Secretary Bushby, the first transmitting a communication from Mr. A. T. Christie, late of the Medical Service, Madras Establishment, reporting his Geological Researches in that part of India, and the second transmitting copies of Papers by Captain G. B. Tremeneere, Executive Engineer, Tenasserim Division, on the Tin Grounds and Manganese Beds of the Mergui Province.

Read also two letters from Mr. H. Cope, dated the 4th and 5th October last, on the subject of the investigation of the Himalyan Lichens.

Read letter from Mr. J. G. Bruce, of 18th October 1841, on the subject of the Nurma Cotton produced in Malwa, elicited with reference to the remarks of Mr. H. Piddington, and noticed in a recent number of the Journal.

Ordered,—That the foregoing Papers be made over to the Secretary in his capacity of Editor, for publication in early numbers of the Journal of the Asiatic Society.

Read letter from Captain S. R. Tickell, with sketches of Idols.

Read letter from Baboo Ramcomul Sen, of 3d November 1841, with a number of Copper Coins, presented to the Asiatic Society by Dr. R. Stuart of the Native Hospital, who, in sending them, writes: "I have much pleasure in forwarding the accompanying Copper Coins, which were given to me as curiosities. When they are really *old*, I know they possess much value in the eyes of such as wish to be thought antiquarians; how far those I send may be deemed valuable, I do not pretend to judge."

Read letter from J. H. Batten, Esq. of 4th October 1841, forwarding some "Loose Leaves" from Thibet, brought down by Deboo, Putwaree of the Juwater Pars (one of the chief Bhotias), who got them from some man in Heoondes (the Thibet name of Kemaoon.)

These "loose leaves" having been submitted for Report to Mr. Csoma, that gentleman writes,

"I beg to inform you that the 24 loose leaves (of blue paper, with Tib. capital character on, written with orpiment, under the following numbers of leaves: 5, 6, 8, 10,

21, 40, 46, 53, 58, 60, 65, 68, 86, 92, 93, 95, 96, 101, 102, 104, 113, 117, 128 and 131,) received from Almora, are the parts of some extracts of some Tántrika works, containing some short address or prayers to Shákya, to Vajra Pani, and to other Saints or Divinities for instruction how to obtain prosperity and future beatitude, and how to be delivered from miseries of the present and of the future life. There are likewise many Mantras or mystical formulæ used in addresses for obtaining the favour of any particular Divinity: also, when presenting some offerings, &c. All such Mantras are in Sanscrit, but written in Tibetan character. There are in the Asiatic Society's Library many works on similar subjects."

The Secretary submitted for the inspection of the Meeting, facsimile Inscriptions, sent down by Lieutenant A. Cunningham, reporting at the same time, that having had these Inscriptions translated, they do not possess any thing of interest or novelty to require any further specific notice.

With reference to Dr. Forbes' communication on the discovery of a complete copy of the *Jami ul Tawarikh*, printed in the 107th Number of the *Journal of the Asiatic Society*, the following communication was read from H. M. Elliot, Esq., of Allahabad, of 20th September :—

"Not having yet observed any notice of *RUSHEED-OO-DEEN's* book at your periodical Meetings, I think it proper to bring to your notice a circumstance which came to my knowledge about two months ago, and which I should have mentioned earlier, had I thought it would have escaped observation so long. An anonymous work on History, bearing the same titles of chapters as *RUSHEED-OO-DEEN's* was brought by (the late) Sir JOHN MALCOLM from Persia, and presented to the College at Fort William, of which your Society has the Library. The work was copied at (I think) Casbin in 2616, and bears the title of *Jami-oo-Tuwareekh Judeem*, but without name of the author. This information I obtained one day from Stewart's Catalogue of Tippoo Sultan's Library, and I now communicate it, after this long delay, in the hope that a little search in your own archives will reward you with the discovery of this valuable work."

A search having been made as suggested by Mr. ELLIOT for the book, the Secretary had the satisfaction to report to the Meeting, that it was found, and the volume submitted to inspection.

The presentation by Moulvee Abdool Ruheem of a copy of the translation by him in Persian of the *Kamoos* was acknowledged by the Society by a vote of thanks, and the presentation in return to the Moulvee of all the Arabic works printed by the Society.

The Secretary submitted to the inspection of the Committee a folio containing Sketches by Lieutenant Colonel Salter, of the (late) 2d Regiment Light Cavalry, taken by him during his service in Afghanistan.

For these presentations and contributions, the thanks of the Society were accorded.

Proceedings of the Asiatic Society.

(Friday Evening, 3rd December, 1841.)

The Hon'ble Sir EDWARD RYAN in the Chair.

The Reverend WM. WINCHESTER, Chaplain at Berhampore, proposed at the Meeting of the 11th November last, was ballotted for and duly elected.

Ordered, that the usual communication of his election be made to the Reverend W. WINCHESTER, and that he be furnished with a copy of the rules of the Society for his guidance.

Library.

Books received for the Library of the Asiatic Society for the Meeting of the 3d December, 1841.

The Annals and Magazine of Natural History, vol. 7, Nos. 45 and 46, July and August, 1841,	No. of Copies.	2
Edinburgh New Philosophical Journal, by Professor JAMESON, No. 61, April to July, 1841,		1
Calcutta Christian Observer, December, 1841, new series, vol. 2d, No. 24, ..		1
Bulletin de la Société de Géographie, 2d series, tome 14, ..		1
Journal des Savans for April, 1841, Paris,		1
Letter addressed to the Government of Bombay by the Chamber of Commerce at the Presidency, 1841,		1
Liber As—Sojutii de nominibus relativis, Lugduni, Bat. 1840,		1

Read letter from the Secretary to the General Committee of Public Instruction of 26th November last, forwarding such Oriental books mentioned in the following list, as can be spared from the Library of the Education Committee :—

List of the Oriental Books, forwarded for the Library of the Asiatic Society.

SANSKRIT WORKS.

Vikramorvosi,	No. of Copies.	1
Uttaramchuritra,		1
Mudra Rakshaha,		1
Mugdhobodha, ..		1
Bhatti Kavya, 2 vols.		1
Raghu Vansa, ..		1
Sahitya Durpon,		1
Kavya Prokasa,		1
Bhasa Parichhed,		1
Mricha Kati, ..		1
Munu Sanghita, 2 vols.		1
Viavusta Ratnamalah, ..		1
Duttuck Chundrica and Mimansa,		1
Law of Inheritance,		1
Subhabilaḥs,		1
Principles of Chemistry, E. B., ..		1

Wilson's Dictionary,....	....	....	....	....	....	....	1
Bebaud Chentamony, ..	....	....	....	....	....	....	1
Malatee Madhava, ....	....	....	....	....	....	....	1
Retnavoli, ....	....	....	....	....	....	....	1
Khetro Tutto Depica, ..	....	....	....	....	....	....	1

PERSIAN AND ARABIC WORKS.

Kyfayah, 4 vols. ....	....	....	....	....	....	....	1
Suddedee, ....	....	....	....	....	....	....	1
Fussoli Abqrat, ....	....	....	....	....	....	....	1
Mill's Bridge's Algebra, ....	....	....	....	....	....	....	1
Shanamah, ....	....	....	....	....	....	....	1
Mujumah Sumshi, ....	....	....	....	....	....	....	1
Æsop's Fables,.. ....	....	....	....	....	....	....	1
Syer Mutakherin, ....	....	....	....	....	....	....	1

Total No. of Copies, 29

Read letter dated Simla, 16th November 1841, from Capt. J. T. BOILEAU of the Engineers, forwarding an account of the Meteors which appeared there on the night of the 12th idem, in sufficient quantities to establish the fact of their excess over ordinary occurrences of the kind.

Read a 4th Memoir on the Law of Storms in India, being remarks and documents relative to the loss of the ship *Golconda* in the Tyfoons of 22d to 24th September 1840, in the China Sea, by H. PIDDINGTON, Esq.

Read remarks by Capt. J. T. Boileau, Bengal Engineers, on the Construction of Newman's improved Portable Barometer, and on the mode of renewing the Guage Point when lost, with a drawing.

The Secretary also submitted to the inspection of the meeting, a Perpetual Moon Table by Capt. R. SHORTREEDE, who on a former occasion favored him with a Perpetual Time Table.

The foregoing Papers and Table, the Secretary noticed, would appear in early numbers of his Journal.

Read the following Report of the Curator for the month of November last:—

SIR,

During the brief period that has elapsed since the occasion of our last Meeting, but little has transpired that can be embodied in my present Report. Due progress has been made in determining and labelling the collection of Birds, which I trust will be entirely accomplished by our next Meeting. I have also commenced arranging the Insects, and shall soon have ascertained and labelled the order *Lepidoptera*, to the extent of my present means of determining the genera and species: The donations received for the Museum consist solely of Zoological specimens: viz. 1st, a Bat from Dr. Cantor, being the third species of Indian *Taphozous* now in the collection, whereas I believe but one has hitherto been described from this part of the

world; 2dly, a skull of a species of *Lutra*,* and the lower jaw of a *Delphinus* (species undetermined, and where taken I was unable to learn, though it was believed somewhere on the high seas, and not in the vicinity of India), from Mr. C. Harvey; 3dly, 4 species of recent Birds, from W. Frith, Esq., of which three are new to the Museum; and 4thly, a fine recent *Crocodilus biporcatus*, 9½ feet long, shot and presented to the Society, at the suggestion of J. M. Seppings, Esq., by the Superintendent Engineer at the Government Steam Yard, — Jones, Esq.

The following Birds have mostly been shot by myself; a few have been purchased, and those presented by Mr. Frith to the Society are included:—

Palæornis torquatus, female.

Falco tinnunculus, do. in first plumage.

Elanus melanopterus, do. do.

Haliæetus Pondicerianus, do.

Vultur leeuconotos, preparing as a skeleton.

Otus brachyotus.

Coracias Indica, two male specimens, in a phase of plumage which warrants the suspicion that *C. Assamensis* (McClelland and Horsfield), of which we possess a specimen noticed in my last Report, entirely according with the description, is a variety merely of the common Indian Roller.

Merops Indicus, male and female.

Alcedo Bengalensis, male and female.

Dendrocitta vagabunda, male and female.

Pastor tristis, male and female.

P. cristatellus, male.

P. cinereus ferdoa, male and female.

P. fuscus, (?) Wagler; *P. Mahrattensis*, Sykes.

Sturnus contra, male.

Alauda, species undetermined, and apparently undescribed.

Dicrurus balicassius, sexes in different states of plumage.

Chloropsis Malabaricus, male in immature dress.

Geocichla rubecula, male.

Calliope Lathamii, female.

Muscicapa cærulea, male.

Jora tiphia, ditto.

Anthus rufescens (?), ditto.

Motacilla alba (vera), two very different males and a female.

Pyrrhulauda crucigera, male.

Columba tigrina, male.

Ardea Malaccensis, male and female, immature plumage.

A. Javanica, Horsfield; *A. scapularis*, Wagler, young female.

Sterna, species undetermined, female.

Tadorna Bellonii,† male.

* I have since procured a recent animal of this genus, to all appearance the *L. vulgaris*, and the skull of which entirely accords with that above noticed.—*Cur. As. Soc.*

† In the Proceedings of the Zoological Society's for 1834, p. 50, Mr. Gould notices a specimen of the common Shieldrake from Trebizond, and remarks that it had not previously been observed

Pelicanus rufescens (?), Gmelin, * female.

Of these, the *Otus*, *Pastor pagodorum* and *P. fuscus*, *Alauda*, *Motacilla*, *Pyrrhulauda*, *Tadorna*, and *Pelicanus*, (seven species,) are new to the collection; and the remainder have replaced old and very inferiorly mounted specimens, and in several instances have added the other sex, in a different state of plumage to what was previously in the Museum

The only other *Vertebrata* procured, consist of a Squirrel (*Sciurus palmarum*), a fine specimen of the Dhamna Snake (*Caluber Dhamna*, Cantor), and the Crocodile before mentioned, which is in process of being set up, while its skeleton is also preparing, and several of the viscera have been preserved in spirits.

A number of Insects have also been collected in the neighbourhood; and several of the Bird Skins from Tenasserim and the Himalaya, noticed in my Report for last month, have been mounted. The present being the only season at which fresh specimens of animals will bear to be brought from any distance in available condition, I continue to spare no pains to induce the Shikarees and others to supply us with as many species as they can procure; the duplicates of many are valuable for purposes of exchange and transmission to other Museums, and while the examination of such enables me to gain a more thorough knowledge of their various kinds, a rectification of many synonyms will doubtless accrue from the intercourse which it is thus sought to establish with Museums in different countries, and which it is to be regretted is not more general and extensive than at present.

I am, Sir,

Yours obediently,

EDWARD BLYTH.

December 3rd, 1841.

Read letter from Mr. Secretary BUSHBY, of the 10th November last, transmitting copies of Registers of the rise and fall of the Tide at Prince of Wales' Island and Singapore, for the months of April, May, and June, 1841, together with transcript of a memorandum which accompanied the Registers.

Ordered—That the thanks of the Society be conveyed to the Government for the Registers in question.

For the Presentations and Contributions, the thanks of the Society were accorded.

out of Europe. Mons. Temminck, however, had already enumerated this species in his list of European birds met with in Japan, and it was obtained by the late Sir A. Burnes on the Indus. Here it would appear to be very rare, being quite unknown to our taxidermists.

* This agrees tolerably well with the description in Shaw's Zoology, (vol. XIII, pt. I, p. 114,) except that the feet are there stated to be yellow, whereas in our bird they were of a leaden black colour, slightly tinged with green, and the claws white.

JOURNAL

OF THE

ASIATIC SOCIETY.

Report to the Secretary of the Board of Customs, Salt and Opium, on the Salts, called PUCKWAH and PHOOL-KHAREE; with a process for detecting the adulteration of Government Salt; estimates of the quantities of both Salts annually produced, and of the amount of loss which the Revenue may sustain through the production of these two articles. By HENRY PIDDINGTON, Esq.

As requested, I have now the honor to submit my report on the samples of PUCKWAH and PHOOL-KAREE Salts which I have examined, together with such considerations as have occurred to me in the course of the investigation.

From what I have learnt of the points desirable to be ascertained, and for more convenient reference, I have divided my report as follows:—

- I. Constituents of the two Salts.
- II. Means of detecting the adulteration of Government Salt.
- III. Chemical demonstration of the certainty of this method.
- IV. Estimate of the quantity of PUCKWAH produced annually.
- V. Estimate of the quantity of PUCKWAH, or edible Salt, annually produced in the preparation of the KHAREE, and of the quantity of KHAREE annually produced.
- VI. Estimate of the loss to the Revenue by the PUCKWAH and PHOOL-KHAREE.
- VII. Concluding remarks.

I.—*Constituents of the Salts.*

The PUCKWAH is mostly produced during the manufacture of Salt-petre, and sold openly in the bazars for culinary purposes. The Phool-Kharee is manufactured from the efflorescence on the surface of various earths, and sold, as well as other inferior sorts of Kharee, ostensibly for feeding cattle and manufacturing processes,* such as curing hides and the like: the former sort, or PHOOL-KHAREE, really for the purpose of adulterating Government Salt. I mention these few facts preliminarily, though well known to you, as I shall have occasion to recur to them again.

Puckwah.

The effects of reagents on the solution are as follows:—

Tests.	Shewing	
	Acids.	Bases.
Muriatic acid, ...	No Carbonates,	_____
Nitrate Silver, ...	Muriatic, (abundant,)	_____
Acetate Barytes, ..	Sulphuric,	_____
Gold Leaf,...	Nitric, (trace,)	_____
N. M. Platina, ...	... ..	No Potass
Oxal. Ammonia, ...	... ..	Lime, (trace,)
Phosphate Soda & Ammonia,	... ..	Magnesia.

Its constituents were found to be in 100 parts, taken in its usual state,

Insoluble matter, ...	1.20
Extraneous Salts soluble in Alcohol, principally Muriates of Magnesia and Lime, ...	15.35
Sulphate Soda, dry, ...	2.45
Muriate Soda, ...	75.00
Traces Nitrates, Lime, Soda, and Magnesia,...	0.50
Hygrometric water and loss, ...	5.50
	<hr/> 100.00

The essential parts of this, for revenue purposes are, in briefer terms, that the Puckwah contains 75 per cent. of culinary salt, and that

* Report to the Board, says, there are three sorts, "PHOOL-KHAREE," or refined KHAREE; "BHE'R-KHAREE," or sheep's KHAREE; and "CHOOMAR-KHAREE," or CURRIER'S-KHAREE.

its bitter taste is owing to the Muriates of Magnesia and Lime and the Sulphate of Soda.

Phool-Kharee.

Tests.	Shewing					
	Acids.			Bases.		
Muriatic Acid,	No	Carbonates,	_____	_____	_____	_____
Nitrate Silver,	Muriatic,	_____	_____	_____	_____	_____
Acetate Barytes,	Sulphuric,	_____	_____	_____	_____	_____
Gold Leaf,	No Nitric,	_____	_____	_____	_____	_____
N. M. Platina, ... ..	... ..	... ..	... ..	No potass,	_____	_____
Oxal. Ammonia, ... ..	... ..	... ..	... ..	Trace Lime,	_____	_____
Phosphate Soda and Ammonia, ... ..	... ..	... ..	... ..	Do. Magnesia,	_____	_____

100 parts of the Salt in its usual state contain,

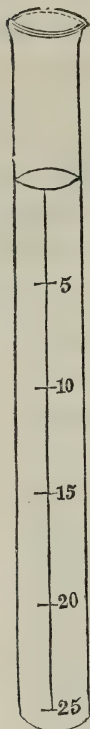
Insoluble matters, ... ..	... ..	... ..	... ..	1.20
Soluble in Alcohol Murates,	... ..	... ..	... ..	0.75
Lime and Magnesia, ... ..	... ..	... ..	... ..	Trace.
Muriate Soda, ... ..	... ..	... ..	... ..	2.45
Sulphate Soda, (dry), ... ..	... ..	... ..	... ..	80.00
Hygrometric water, .. ...	... ..	... ..	... ..	7.50
Water of crystallisation* and loss,	... ..	... ..	... ..	8.10
				100.0

Here, as before, the essential part of the analysis for Revenue purposes, is, that the Salt is really one containing about 80 per cent. of dry Sulphate of Soda, or dry Glauber's Salt.

II.—*Means of detecting the adulteration of Government Salt by the Phool-Kharee.*

The prompt, certain, and easy method of detecting this adulteration is the following one:—I set down here the mere rules, such as Native officers would, with a little teaching, quickly understand; the chemical demonstration of them will follow in the next section.

* A small part of the sulphate of soda is in the state of crystallised salt, which contains 56 per cent. of water. The greater part of it, however, is in the anhydrous state.



The following is the necessary apparatus, all of which can be made or procured in the bazar :—

1. A glass tube about 0.5 inches in diameter, and 10 inches high, as in the marginal sketch. It is graduated to 25 divisions, on the principle shewn in the next section.

2. A common precipitating glass, containing about a quarter of a pint.

3. A pair of common medicine scales, with a single brass weight of 100 grains.

4. A bottle of solution of Acetate of Barytes, of the strength shewn in the next section.

5. A few straws, or a bone or ivory rod, for stirring the solution of the suspected salt.

To detect an adulteration.

A. Weigh 100 grains of any suspected Salt, and put it into the precipitating glass, fill the glass two-thirds full of clear water, and stir the salt till all has dissolved. A few grains will perhaps remain at the bottom, but these, which are sand and sulphate of lime, are of no consequence. Let the whole settle for a few minutes.

B. Fill your test tube from the bottle of Acetate of Barytes *exactly* to the upper mark.

C. Drop now, carefully, the liquid from your test tube into the solution of the salt. If there is any adulteration a heavy white cloud will be seen rolling quickly to the bottom. You must continue to drop in the solution till there is no more of this cloud; taking care that you allow it to settle from time to time, and not to put in *too much* of the test, particularly at the latter end of the operation.

D. The quantity of solution you have used, will be seen by looking at the tube. If it is 10, or 12, or 15, this is an adulteration of so much Kharee per cent. in your sample; and if it exceeds*—per cent. the Salt *must* have been purposely and illegally mixed with Kharee.

* This blank will be of course better filled up by you. It would be proper to make a set of trials with various Government salts before definitively settling it. It will never I think exceed 4 per cent., or at most 5.

E. Unless you want to know *exactly* the total amount of adulteration, which is rarely the case, you need only first drop in, say the 5 per cent. allowed by the Board, and after that 5 or 10 more. If it shews this, it is quite adulteration enough to prove that the salt has been purposely falsified, and there is no use in wasting your time and test liquor farther.

III.—*Chemical demonstration of the certainty of this method.*

1. It has been shewn that there are no Carbonates in the Kharee ; and the proportion of Sulphate of Magnesia is so small in good salt,* that for practical purposes, it may be neglected or allowed for. The Sulphate of Lime may also for practice be considered as wholly insoluble in cold water.

2. We have thus only to deal with the fraudulent admixture of the anhydrous Sulphate of Soda, and perhaps at times with a little Sulphate of Potass. The problem is therefore, really, reduced to the simple one of ascertaining the quantity of Sulphuric Acid in a given quantity of salt. We may always assume that the base is Soda. The working fact for revenue purposes is, that *no* Sulphuric Acid [which in saline compounds form the Sulphates] *can* be present in good salt beyond the per centage which we allow at page 942 without having been put there for fraudulent ends ; and in the state of Sulphate of Soda, *because* there is no other Sulphate available for so doing in the country.

3. We may take our specimen, containing 80 per cent. of the dry Sulphate of Soda, to be the strongest average salt used for adulteration. If a weaker sort, that is a Kharee containing more extraneous salts be used, more of it will be put into the parcel of salt to be adulterated.

4. If we take 100 parts of good salt to be adulterated with 25 per cent. of Kharee, it is clear that in this quantity there is $\frac{1}{4}$ of the 80 parts [or 20 parts] of the dry Sulphate of Soda which our analysis shews ; the remaining 5 parts being made up by the extraneous salts.

* It is only 0.45 in bazar salt by Dr. McClelland's recent paper. By my analysis of Madras salt and Cuttack Pungah salt made several years ago, it was 2.04 for the first, and 5.45 for the last, the mean of these would be 3.7 per cent. Mine was I think very fresh salt, taken from the heaps. As before noted, trials should be made before fixing a standard allowance.

These 20 parts of dry Sulphate of Soda contain 11.20 of Sulphuric Acid, which require 37.50 parts of Acetate of Barytes to precipitate them.

5. Now our solution of Acetate of Barytes is made by dissolving 100 grains of the salt in 1000 grains of pure water,* and the tube filled to the mark, containing exactly as much of the solution as is equal to 37.50 parts of Acetate of Barytes, the whole of its contents will thus precipitate the 20 parts of dry Sulphate of Soda, which the adulteration of 25 per cent. contains.

6. And, as it is marked with 25 divisions, each division will shew one per cent. of such an adulteration. As before remarked, a weaker Kharee would allow more adulteration, but as it would shew always a nearly equal quantity of the Sulphate, this may be taken for a standard. I do not believe that a much stronger Kharee could be prepared. Could it be so prepared as to contain 90 per cent. of the Sulphate, this would only make a difference of $2\frac{1}{2}$ on the scale in the whole per centage, and for practice nothing beyond proof of, say 10 per cent. of the Sulphate of Soda, is really wanted to be known.†

7. If we like to take our scale as representing the exact quantity of Sulphuric Acid (which will then be an *exact* index to the quantity of Sulphate of Soda) we must remember that the 37.50 parts of Acetate of Barytes contained in the tube, are divided by the graduation into 25 parts; and as this quantity of Acetate of Barytes is equivalent to [or will precipitate] 11.20 of Sulphuric Acid, we have thus 25 divisions for 11.20 of Sulphuric Acid. Every five divisions will then represent 2.24 [or $2\frac{1}{4}$] of Sulphuric Acid, so that we may say in practice, that every $2\frac{1}{2}$ divisions of the scale will shew about $1\frac{1}{8}$ th part of Sulphuric Acid, or nearly two of Sulphate of Soda: every five divisions representing exactly four parts of the pure Sulphate of Soda; and five of the adulteration, because of the extraneous salt and water.

* This solution, at the temperature of 84° is of sp. grav. 1.36, and the Acetate is preferred, because of its cheapness and facility of making it, and because if Murates or Nitrates are to be sought for, it is not in the way. The Murate or Nitrate of Barytes may of course be used if desirable, the tubes being graduated accordingly.

† Here, as before, I need not remark, that a set of careful trials should be made with the Phool-Kharee of various parts to fix a standard. This can only be properly done in the district.

IV.—*Estimate of the quantity of Puckwah produced annually.*

The Report to the Board estimates the annual produce of Puckwah at $1\frac{1}{4}$ lac of maunds. I presume this is a mere conjectural estimate, at least I have not learnt on what it is founded. The following data and estimate appear to me to have good chemical foundation.

1. Mr. Stephenson [Treatise on the manufacture of Saltpetre, and papers in Journal of Asiatic Society] says, that the average of Muriate Soda obtained by him from 20,000 maunds of *Dooah** or crude Saltpetre from Loll Gunge in Tirhoot at the Company's factories, which he superintended, were as follows :—

Average per cent. of Muriate of Soda from good <i>Dooah</i> ,	... 4.2
From <i>Dooah</i> of native factories,	... .. 3.7
	<hr/> 7.9
Mean,	<hr/> 3.95

and that only about 35 per cent. of this *Dooah* is Saltpetre. Hence we shall not, I think, exaggerate, if we say according to his results, (Pamphlet, page 47,) that in the average of factories, 2 maunds of *Dooah* (35 per cent. would require nearly 3 maunds) go to the production of one of Saltpetre. In round numbers we may also say, that as the average of good *Dooah* gives about 4 per cent. of Muriate of Soda,† there will be about 8 per cent. of it produced for every maund of good Saltpetre. But then, as we have seen by our analysis, there are but $\frac{3}{4}$ (75 per cent.) of *pure* Muriate of Soda in Puckwah, we must add the other fourth, or 2 per cent. to our 8 per cent. of Muriate of Soda to make it Puckwah. This gives 10 per cent. of Puckwah for 100 maunds of good merchantable Saltpetre.

2. But the preparation of the *Dooah* itself produces a large proportion of Puckwah, as I shall now shew.

3. Dr. Buchanan distinctly says, (Martin's Buchanan, vol. i. Behar, p. 363 and 364,) when describing the manufacture of *Dooah*, that he is assured that *as much* Muriate of Soda as Nitre is obtained by the workmen, and he gives at p. 364 and 365, the details of the manu-

* *Dooah* is in fact the first washings from the Saltpetre heaps or earths, boiled down and sold to refiners of Saltpetre, Natives or Europeans, who make it into marketable Saltpetre: all Saltpetre works must first produce *Dooah*.

† He speaks of some containing 8 per cent.

facture for making and refining the Nitre, with the products of it and of the Culinary Salt, 14 maunds of Saltpetre and 14 maunds of Puckwah. We shall afterwards see this singularly confirmed.

4. He again, in vol. ii. p. 280, when speaking of the manufacture of the Company's Nitre in Bhaugulpore, says, that "there is a concealed source of profit to the contractors," which he promises afterwards to mention, but he has not done so, or Mr. Martin's mutilated edition omits it. No doubt this is the production and sale of Puckwah; for,

5. In vol. iii. p. 332, (Puraniya,) he says, that when the Company's advances for Nitre were withdrawn, their monopoly rendering the private manufacturing of it illegal, the Beldars, 'Salt-makers,' betook themselves to the manufacture of Culinary Salt "from a saline earth found in many parts of the district." A small per centage would not have repaid them, and it is clear that it was no new trade to them as Saltpetre-makers.

6. Again, at p. 334, he says, that a Native agent of the Company assured him, and that some of the Beldars confessed, that they made *Beldari Nemuck*, (the same as the Puckwah,) from a thick brine called *Jarathi*, which subsides in making of their (crude) Saltpetre, which last is of course the same as the *Dooah*.

7. At p. 337, he relates the process for making the *Beldari Nemuck*, which is in fact *Puckwah*.

8. Dr. Buchanan, however, was evidently no chemist, and of questions like these only a chemist can understand the true bearings. Mr. Stephenson, who was a manufacturing chemist, and sent out by the Hon'ble Company, has left us still the best data. He says, p. 8, that he collected the saline soils from various part of Tirhoot to make an average; and he found by analysis that the Nitrates* formed 1.6 per cent. while the Muriate of Soda formed 1.4 per cent. Here we have a direct proof, though from another zillah, that Dr. Buchanan's apparently exaggerated statement, [p. 7,] that *as much* Culinary Salt as Saltpetre is made, may, in some parts at least, be no exaggeration!

9. Mr. Stephenson again shews us, by direct experiment, (Pamphlet, p. 84,) that in the making of *Cootiah* Saltpetre, or Saltpetre made from the earths preserved in factories, which is far richer in Nitre than that

* Of Potass and Lime, the first is Saltpetre, and the last becomes so as soon as it meets with potass, from ashes or vegetable remains, in the Saltpetre heaps.

produced in waste places, or on old walls, &c. the proportion of Puckwah to fine Saltpetre was 1 maund 16 seers to 14 maunds, or exactly 10 per cent. The proportion in earths collected as the *Noo-neas*, (native Saltpetre-makers,) find them, was 7 seers of Puckwah to 22 of Saltpetre, or about 30 per cent. from the mother liquor only, after the making of the Saltpetre. From the whole result [p. 86] the proportion of Puckwah to Saltpetre was 17 seers to 55 seers, or about 33 per cent.*

10. I have not been able to meet with Dr. John Davy's experiments on the factory earths, or with Tennant's work,—if he had any thing on the subject? To Colebrooke I shall refer subsequently.

11. Resuming all these, we find, I think, that there is evidence enough to shew, that if *as much* Puckwah as Saltpetre be not produced, there must at any rate be a large per centage, and I think it cannot be below 30 per cent. for we find that Mr. Stephenson, doing his best, and under the most favorable circumstances—he did not want to produce Puckwah but Saltpetre—could not avoid obtaining 10 per cent. from factory earth of the best quality for Nitre, and 30 per cent. from others. Taking it, however, at only 25 per cent. in all the earths, of which as we have seen [page 7] 10 per cent. *certainly* exists, for it goes with the *Dooah* Saltpetre when sold to the refiner; we have still altogether 25 per cent. of Culinary Salt produced for every maund of good Saltpetre. I shall notice subsequently other sources of it.

12. We must now endeavour to ascertain the total amount of good Saltpetre manufactured in Bengal.

13. The total export of Culmee Saltpetre from Calcutta in 1840, was 4,86,000 maunds, and it has in recent years been as high as 5,14,000 maunds; for the sake of round numbers we may call the exports I think, 5,00,000 maunds.

14. We have next to estimate the internal consumption of Saltpetre for nearly all India, for it can but in few places be made so cheap as in Bengal.

* Again in Journal Asiatic Society, vol. ii. p. 23, he says, that an analysis from several hundred maunds of Native *Dooah* gave 8 per cent. Culinary Salt, (Muriate,) &c. to 77 Nitre. The proportion 8 to 77 is about $19\frac{1}{4}$ per cent. How much had been already extracted from it?

15. I find as a datum [the only one I can obtain,] that, by the return you have obliged me with, the mean importation of Saltpetre into Calcutta, before the abolition of the transit duties, from 1831 to 1835, or four years, was

Factory maunds,	...	...	...	...	...	4,51,446
But as we know how smuggling flourished in those days, even within the Custom House itself, we may I think fairly call the real imports bazar—instead of factory maunds.						
Say then, imports, bazar maunds,	...	...	...	...	...	4,51,446
Average exports for the same period, from Custom House						
tables given by Stephenson, are bazar maunds,	...	...	...	...	...	4,25,683

The apparent consumption of Saltpetre for Calcutta, is

thus bazar maunds,	...	...	...	...	...	25,763
Throwing away the odd hundreds, let us say 25,000 maunds for Calcutta, and this for such a circle of it and its environs as would include a population of a million. If our Bengal Saltpetre grounds and factories supply only as much of all India as includes a population of 50 millions, we have then 25,000 maunds to multiply by 50, or 12,50,000 maunds for the consumption of 50 millions of inhabitants; reducing this again to less than one-half, because of the more quiet habits of country villages, we may still say, that the home consumption equals the export; or that we have 5,00,000 bazar maunds, produced somewhere, for that purpose also.						

14. This appears startling, but when we recollect the almost perpetual volleys of fireworks, small arms and cannons, which are kept up, in one place or other, all over the country, and every day in the year, and often night and day, and that all gunpowder contains 75 per cent. of Saltpetre, we shall not be so much surprised. Here is another calculation bearing upon this matter.

Buchanan in his statistical table states that, for Patna City and Zillah Behar, there are

Atusbaz, or firework-makers,	...	...	..	...	...	118
For the district of Bhaugulpore the same artificers,	...	...	...	...	...	44
<hr/>						
Total ,...	..	...	...	...	...	162

Population (according to him) of Patna and Behar,...	33,64,420
Bhagulpore,	20,19,900
Total,...	5,384,320

In Rungpore he speaks of the gunpowder-makers, but not of the Atusbaz. I do not know if he means the same thing, and it is not unlikely in small places, that the two trades are exercised by the same person. In Calcutta I find they are sometimes mixed and sometimes separate. We must also recollect that, in India, great numbers of individuals as often make their own gunpowder as buy it. I leave then the mere gunpowder-makers out of the question, and look only at the fire-work-makers.

If we take the 162 artizans in this trade, to find employment each for 3 workmen at 5 Rupees, and the master to make 7 Rupees per month we have per month, *Rupees* 22

For 162 artists, this is per month, of profits,* .. 3,564
or 12 per annum profits, .. 42,768

If we take the *profits* to be 10 per cent. on the capital employed, this will be capital employed .. 4,27,680

If we take about three-fourths of this to be in Saltpetre, we may say for Saltpetre, .. 3,00,000
At 6 Rs. per maund, this is, .. *Maunds* 50,000

Now 50,000 maunds of Saltpetre annually, for a population of 5,384,000 would give, for one of 50 millions, about 4,62,000 maunds of Saltpetre, which, when we take all the home-made gunpowder and other manufacturing demands into consideration, is not so far from our former calculation. Patna, Behar, and Bhaugulpore comprise, I may observe, all varieties of population, from a great and luxurious city to the wild Hill tribes; and thus offer the elements of a fair average. Like all Indian statistical questions, the elements are so uncertain, that they are really but mere approximate notions, and I should not have occupied your time with it, were it not that the question of "what is the internal consumption of Saltpetre," is really an important one in our estimate. If we say that the 5,00,000 maunds of Saltpetre are worth at 6 rupees, 30,00,000 Rs., this would still not give an expenditure of one pice each in fire works for 50 millions of population.

* Wages must be paid out of profits.

16. We must then in the absence of better data than the foregoing take

The exports, at bazar maunds,	...	...	...	5,00,000
The consumption at least,...	...	...	...	5,00,000

Total amount of *refined* Saltpetre produced, *Baz. Mds.* 10,00,000

And in the production of this, there appears good chemical ground for assuming, that at least 25 per cent.

of Puckwah are produced, which gives, from the Saltpetre

manufactory alone, Puckwah to the amount of, *Baz. Mds.* 2,50,000

17. We have next to consider, that we may at least look at all the sources of the article, the different notices of the *Salt* works which are to be met with in various authors. This Salt we may also call Puckwah. They will scarcely afford us data, but they should not be passed over in attempting to estimate the quantity of Puckwah thrown into the market.

18. Mr. Colebrooke, (*Remarks on Husbandry and Commerce of Bengal*,) says, page 181, of London edition, that in Oude and Benares, this process of washing earth and evaporating the solution, is followed to obtain *Culinary Salt* without extracting the Nitre, and he details the process, but without any figured statements, as a perfectly familiar one. The proportion of edible Salt must be considerable, and the places where it is found numerous, to render it so well known an operation. Dr. Buchanan, vol. i. p. 550, speaks of the *Salt works* from wells in Ramghur, Zillah Shahabad.* In vol. iii. Dr. Buchanan, as before quoted, says, that the Beldars of Puranya made *Culinary Salt* alone, and he describes it as a separate manufacture at p. 337 and 338, the produce selling at 4 rupees per maund. Mr. Stephenson (*Journal Asiatic Society*, vol. iii. p. 36,) has a valuable paper on the manufacture of Salt in the Ghazeepore district, shewing that the earth contains *half as much* Muriate of Soda as Sulphate of Soda, *i. e.* 1.5. Muriate to 2.7 Sulphate, and that the Salt contains 60 per cent. Muriate of Soda or edible Salt to 37 per cent. of the Sulphate. We have no data by which to ascertain the extent to which this edible Salt manufactory is carried; we must therefore allow it as a

* Mr. Stephenson found the water of wells in Tirhoot to be strongly impregnated with Muriate of Soda.

make-weight in our former estimates of Puckwah. It will be seen in the succeeding section, that we may assume a considerable portion of Puckwah to be also produced in the manufacture of the Kharee, and possibly some in the preparation of the *Reher* or Soda earths, for the use of the washermen, soap-boilers, glass-makers, &c. &c.

V.—*Estimate of the quantity of edible Salt produced in the manufacture of the Phool-Kharee, and of the quantity of Phool-Kharee annually made.*

1. The production of the Salts called the Kars, Karees, and Dhars, is a separate trade where earths are washed for these alone, and they are also produced in the preparation of Saltpetre; we may suppose them not always thrown away when they form so large a per centage as it will be seen they do.

2. Dr. Buchanan says, vol. i. p. 366, that he estimates the production of Dhar at 2 maunds of it to every 14 maunds of crude Nitre. This is $\frac{1}{7}$ th, or say $14\frac{1}{4}$ per cent. which as we allow 2 maunds of crude to make but one of refined Saltpetre, gives $28\frac{1}{2}$ per cent. upon every maund of this article.

3. Mr. Stephenson says, (p. 8), in his Analysis of the soil in Tirhoot, that it contains nearly as much of the Sulphate (Kharee) as of the Muriate and Nitrate together, but as we have before noticed (p. 8) the Culinary Salt obtained from these two sources, I only allude to them here. As a source of Kharee, they should be borne in mind. Mr. Stephenson says, 2.7 of Sulphate and 3.0 of Muricates and Nitrates. In Mr. Stephenson's paper, (Journal Asiatic Society, vol. iii.) on the efflorescence of the Kharee, we find the best datum. He says there, that the efflorescence collected by him gave 58 per cent. Sulphate, (Karee), and 22 of Muriate of Soda; so that, using round numbers, every maund of Kharee from thence would give the workman *one-third* of a maund of Puckwah. This, however, may have been a richer spot than the average. Buchanan says, that some Muriate of Soda is also found with the efflorescence of Carbonate of Soda, (*Rehar* or *Sajee Mutti*); but his work has evidently been sadly

mutilated in this part, and we have no data* to guide us in a calculation. Perhaps instead of 33 per cent., or one-third of a maund of Muriate of Soda to one of Kharee, we might assume with full safety 20 per cent. from this source? The low price of the Kharee, the best the report says, selling for 12 annas per maund, is strong presumptive evidence, that it is not the only product derived from the manufacture.

5. As to the quantity of Kharee produced, the report estimates the total of Kharees at $2\frac{1}{2}$ lacs of maunds. If our estimate, above taken, be correct, we have here 50,000 maunds of Culinary Salt from the Kharee. We may, however, make some attempt to estimate the quantity of Kharee produced. Dr. Buchanan says, as quoted p. 13, $14\frac{1}{4}$ per cent. on the rough Saltpetre. Mr. Stephenson gives 23 per cent. in one case, and $17\frac{1}{2}$ per cent. in another, of the Sulphate, but these proportions must be doubled, because 2 maunds of *Dooah* go to make one of good Saltpetre, which would then give 46 and 39 per cent. The mean of these three; viz.

Buchanan,...	...	...	...	...	...	28½ per cent.
Stephenson,	...	...	...	...	{	46 " "
						39 " "
						<hr/>
						113½ " "
					<hr/>	
				Is,	...	38 per cent.

If we only take this at 25 per cent., which is a larger deduction than the near approach of Dr. Buchanan's estimate, by weight of manufacturing produce, and Mr. Stephenson's by chemical assay, would warrant, we should then obtain, if our estimate of the production of Saltpetre (p. 12) be correct, 25 per cent. upon 10,00,000 maunds of Saltpetre, or 250,000 of Kharee from this source alone; and as this must be of the purer sort, we cannot perhaps go far wrong if we suppose that the work of those *Nooneahs*, who make Kharee only, supplies the consumption of the cattle and the curriers. This is vague enough, but we have no better data. The report says, about 80,000 maunds of each of the three sorts may be produced in all, which would allow only 80,000 of

* This is an important question for research. "Is any Muriate of Soda extracted from the Soda earths?" If so, this may be also a very considerable source of illicit Salt.

the Phool-Kharee to be used for adulteration. I should be much more inclined to rate it at the lowest at double this quantity, or nearer 2 lacs of maunds of the first sort. We have already estimated the amount of Puckwah made with the Saltpetre alone, and we see that the amount of Kharee made with it must be very large. In the European refining factories it *appears*, (for we do not know all the secrets of the trade,) that the extraneous Salts are mostly thrown back to the Saltpetre heaps; yet with the large deductions I have made, and Dr. Buchanan for our authority, that the Nitre-makers *do* sell it, we shall not perhaps at all events exceed in saying that, every thing considered, at least a lac of maunds of Phool-Kharee may be thrown into the market for adulteration, and 25,000 maunds of Puckwah be produced in the making of Kharees of all kinds?

VI.—*Estimate of the loss to the Revenue from the foregoing sources.*

				<i>Maunds.</i>
Puckwah from manufacture of Saltpetre,	...	...	...	2,50,000
From Phool-Kharees,	...	...	..	50,000
Phool-Kharee sold for adulterations,	...	...	...	1,00,000
Total maunds,	...	...	...	4,00,000

This being all sold as Government Salt, gives

Total value at 400 rupees per 100 maunds, Co.'s Rs. 16,00,000

Of which loss to Government at 300 rupees, is Co.'s Rs. 12,00,000

VII.—*Concluding Remarks.*

This amount of loss to the Revenue seems enormous, but we may notice

1. That the nature of the Salt is a chemical certainty.
2. That we can attach the highest confidence to Mr. Stephenson's results, because he had no motives to wilful misrepresentation any way, and might fully expect his results and statements would be closely examined in Calcutta, so that his professional character as a chemist was at stake. I add, that from personal knowledge of him as a working chemist, I feel quite satisfied, that they *are* entitled to full confidence.

3. That even now our knowledge is evidently very imperfect, and the probability is, when we recollect that since our possession of these provinces Mr. Stephenson seems to be the only practical chemist who understood what he saw about him, that there are many more things for a chemist to discover.

4. I have, it will be observed, indicated some sources which can only be taken into account as make-weights; what may be the aggregate amount of all these we know not. It may be much larger than we suspect.

Postscript.

Fortunately I had not seen the report of the officer deputed to enquire on this subject before handing mine to you; and indeed I had but a few minutes' conversation with him before entering on the investigation, and the results of this conversation I have stated in my report. I say "fortunately," because it is most satisfactory to me, as it must be to the Board, and to him, that in so intricate and uncertain an investigation, two reports founded, the one upon local inquiry, and the other upon chemical and statistical deductions from a mixture of certain and uncertain data, the main results should so closely approximate. To shew how nearly they do so, and where they differ, I set down briefly in parallel columns, our results, following the order of my sections, and add my remarks at the end of each, where required.

Section I.—Chemical constituents of the Salts.

PUCKWAH.

Report says "Par. 38. Is informed that good Puckwah contains 10 Nitre, 53 Culinary Salt, 21 Kharee, Sulphate of Soda, &c. 16 various Salts."	I shew, that the sample analysed contains 75 Culinary Salt, no Nitre, $2\frac{1}{4}$ Kharee, and 15 extra-neous Salts.
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"Par. 60, contains Nitre."

Note.—It is possible, and indeed most probable, that every sample differs, and in this the report agrees with me. But I should exceed.

ingly mistrust the information of any manufacturer, European or Native, on this subject, as see Par. 53, where it is said that the export of the Puckwah is kept secret as being illegal; see again p. 57. As there *must* be from 8 to 10 per cent. of water and insoluble matters in the Puckwah; this seems for a chemist a very rough note indeed. Next, what is meant by *good* Puckwah. Puckwah which sells well I suppose? for they could, I think, separate most of the 10 per cent. of Nitre and the Kharee with ease? I presume this mixture is that which best disguises the taste of the factitious Salt, or else that as mentioned farther, the factory servants had an interest in producing more Puckwah? Of the chemical constituents of the Kharee, the report says nothing.

Sections II. and III. have nothing in which we can compare, being wholly new.

Section IV.—Estimate of the quantity of Puckwah produced annually.

First from the Saltpetre manufacture in all its stages.

<p>Report, “ Par. 38. Very little Puckwah produced in the <i>refining</i> of Saltpetre, but afterwards, Par. 47, 6 per cent. occurs even with European superintendence, and the actual produce of it should be therefore reckoned from the <i>Dooah</i>. Par. 43. European factories <i>have</i> 6 to 8 per cent. Puckwah on their produce of <i>refined</i> Saltpetre.”</p>	<p>I deduce that the produce is to be really calculated from the <i>Dooah</i> and in <i>its</i> preparation. That on the whole, with every allowance and deduction, it will not be excessive to say, that, for every maund of refined Saltpetre in the market, 25 per cent. or 10 seers may be allowed as the average production of Puckwah in making it.</p>
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<p>“ In a small factory Puckwah amounts to 10 per cent. on the refined Saltpetre.”</p>	<p>Thence it would appear, that it really must at least reach to this amount.</p>
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“ Par. 44. Four factories near Patna give 24, 30, 50, and 56 per cent. Puckwah!”

“ Par. 45. *Nooneahs* allow that their produce amounts to about

25 per cent. on their crude Nitre,
[*Abee or Dooah.*"]

"Those of Behar and Shaha-
bad may even obtain as much Salt
as Saltpetre."

That there are in various parts
Salt works, of which we have no
notice; but I allow their produce
as a make-weight.

"Par. 49. And in northern
Tirhoot, the name of Saltpetre is but
a cloak for the making of Salt."

V.—*Puckwah produced with the Kharee, and the quantity of Kharee.*

Report says, "Par. 61. The
Phool-Kharee contains Puckwah."

I deduce that it certainly must
be produced with it, to the extent
of at least 25,000 maunds.

"Par. 71. Puckwah made in N.
E. Tirhoot."

From Saltpetre and other data,

"Quantity 1,83,000 maunds, but
is now said to be [from the tax]
3,23,680 maunds, and 50,000 in

1,00,000 maunds Phool-Kharee
will not be excessive, or 3 lacs of
all sorts.

Sarun of all sorts—Total 3,73,680
maunds."

Section VI. and VII.—Little or nothing in common with the Report.

To conclude. The first object of my paper was to shew, that the
adulteration might not only in the hands of a chemist be *detected* by
very simple means, but that it might be *measured*. This measure-
ment I see removes another of the difficulties before the Board, which
is the detection of the adulteration of good Salt by Puckwah.

From the statement of the report to the Board, it seems that
Puckwah also contains 21 per cent. of Kharee or Sulphates. In this
case, the Puckwah is in fact but a mixture of Kharee and Puckwah;
but taking our sample as a very pure one, a really *good* Puckwah, we
see it contains $2\frac{1}{4}$ per cent. Kharee. Now, say the Government
allows for chance impurities 4 per cent. of Sulphate, we may fairly
take the medium between the 21 per cent. mentioned above, and our
very pure sort as an average sort. This will be about 10 per cent.
which is an amount distinct enough to be shewn to the clumsiest hand

by the use of the test, which thus becomes in all probability as good a one for the adulteration by Puckwah as for that practised by means of the Kharee.

Calcutta, 31st October, 1841.

Remarks by Captain J. T. BOILEAU, Bengal Engineers, F. R. S., F. R. H. S., on the construction of Newman's improved Portable Barometer, and on the mode of renewing the Gauge Point when lost; with a Drawing.

A recent modification has been made in the portable (or as it is more commonly called the mountain) Barometer, by Mr. Newman of Regent Street, London, whose standard Barometers have become so justly celebrated; and believing that a description of these instruments has not yet been published in India, I am induced to forward the accompanying sketch of their construction, and at the same time annex the result of some comparisons made with two of these portable instruments, and the Observatory standard, for the purpose of determining the gauge (or neutral) point of the latter, which had been lost in both by the escape of a considerable portion of mercury from their cisterns.

In the best portable Barometer of Troughton, Dollond, and Cary, the surface of the mercury in their cistern is brought by a simple mechanical contrivance to the level of a gauge point, (the Zero of the divided scale; by which the height of the column is read,) a measure of which if the gauge point were invariable, would do away with the necessity for a correction on account of the varying height of the mercury in the cistern, due to the rise and fall in the column.

The gauge point, or line, is not however invariable in either of the above constructions save Cary's; and Mr. Newman's object appears to have been to devise an instrument, which should be independent of the adjustment, preliminary and essential to each observation in those of the above kind, and whence the true height of the mercurial column should yet be deducible with as much accuracy, as if it had been read from the absolute Zero of the scale.

It is in the construction of its cistern that Newman's portable Barometer differs chiefly from others, and a description of this part, therefore, is all that is essential.

The cistern, (shewn in section in the figure) is of iron, and is divided into two chambers, A the superior, and B the inferior; communicating when in a given relative position with one another by a fine hole *o, o*, passing through the bottom of the upper, and top of the lower chamber, the bearing surfaces of which are ground mercury-tight together; the lower chamber has motion round the common axis of the cistern through an arc of about 90° , so that by turning it a small quantity only, the connection between the two chambers is cut off, the continuity of the small hole being broken. Into the upper chamber the glass tube is inserted in the usual manner by means of a thick box-wood cap, which is pierced also to admit the stem of a small Thermometer, having its bulb immersed in the mercury of the cistern. A brass cylindrical case in two parts covers the cistern, each part being attached to its corresponding chamber. A hollow mahogany tube is attached by screws to the upper part of the brass case, and a brass scale of about 14 inches in length screwed to the wooden tube registers by means of a vernier reading to the 500th part of an inch, (and by estimation to the 1000th part) the height of the mercurial column.

The instrument having only a partial scale, and this not being directly referable to the surface of the mercury in the cistern, it is evident that to establish a correct Zero or neutral point, the capillarity of the tube must have been accurately determined beforehand; this done, a comparison is made with a standard instrument, and a point marked on the brass scale, (which is as yet undivided,) gives, after allowing for the difference in the capillary action of the two tubes, the Zero reading, or neutral point, of the portable Barometer.

An example will better explain this operation, upon the accuracy of which the correctness of the instrument depends.

Let the capillarity of the tube of the standard Barometer be $+.002$ inches, and that of the portable instrument $+.037$ inches, then if at the time of the comparison for determining the neutral point of the latter instrument, the mercurial column of the standard stood at 25.362 inches the corresponding height for the portable Barometer would be

$$25.362 - (.037 - .002) = 25.327 \text{ inches,}$$

which would be the Zero, or neutral, reading at the temperature of comparison; to and from this point the other divisions of the scale (inches, tenths, and half-tenths,) would be set off.

The neutral point being thus determined, the true height of the column of mercury above the level of the surface in the cistern for any other reading is deduced in the following manner :—

Let $a \dots \dots b$ (see the section,) be the line of level corresponding to the neutral point, and suppose a fall to have taken place in the mercurial column, a proportional rise will take place in the level of the cistern, and the converse exactly for a rise in the column, which will be accompanied by a corresponding diminution in the level of the mercury below. The variations in height being inversely proportional to the areas of the occupied portion of the tube, and of the cistern; or, which is the same thing, inversely as the squares of their diameters, since, in Mr. Newman's portable instrument, both tube and cistern are cylindrical. If then, D represent the interior diameter of the cistern, and d, d' respectively the interior and exterior diameters of the tube, all expressed in terms of the same linear unit; also if, h represent the height of the column at the neutral reading, and h' any other observed reading, then the true height of the column H for that observed reading will be

$$H = h' \times \left(\frac{h}{h'} - h' \times \frac{d^2}{D^2 - d^2} \right)^{-1}$$
 at the temperature l° —in which the upper sign is to be taken when the observed reading is greater, and the lower sign, when it is less than the neutral height. The factor $\frac{d^2}{D^2 - d^2}$ is constant for the same Barometer, and is what Mr. Newman calls, the *correction for capacity*—it is determined experimentally by the maker, and together with the neutral reading and temperature of comparison of the same, is stamped upon an ivory collar attached to the wooden case of each instrument.

It is much to be regretted, that the ingenuity and care displayed in the construction of the cistern of Newman's portable Barometer, (which is the same in principle as in his standard,) should be entirely thrown away by the exceedingly primitive and imperfect make of the other parts. For reduced, or indeed for good comparative observations, no Barometer is to be trusted, the scale of which is not divided on a brass or other metal rod extending the whole length of the instrument—but this, it has been seen, is not the case in that just described. There would be no difficulty, however, in fulfilling every desired requisite of the above nature in the construction of Newman's portable Baro-

meter, and thus improved, it would be found one of the most convenient, safe, and elegant instruments of its kind ever made, instead of being, as it now is, an almost useless toy.

In proof of this assertion, it is only necessary to mention, that both the portable Barometers brought out as a part of the equipment of the Simla Magnetic Observatory, were found to be quite unserviceable the very first time they were taken out for use; the mahogany tube was loose in the brass case of the cistern, and in one, (No. 44,) had warped, so as to have broken the Thermometer; in both, the boxwood cap, which attaches the glass tube to the cistern had shrunk, so that the mercury escaped in large quantities, and the neutral point being thus lost, the Barometer was of course, in its present state, useless for absolute measurements; but having no other instruments, it became an object of importance to repair, if possible, those in my possession, and to institute a gauge point or neutral reading for them by comparison with the standard in the Observatory, and I am induced to forward an account of the method in which this has been effected more *pour encourager les autres*, who may be left to their own resources as I have been, not to set aside even an imperfect instrument without an effort to improve its condition: for the result of my own attempt has certainly proved as successful as, under the circumstances, could have been expected. It is of the first importance too, in the publication of altitudes determined by the Barometer, that the quality of the instrument employed should be known, and as the two portable Barometers in my possession will be used frequently for determining the relative heights of mountains by simultaneous comparisons with the standard in the fixed Observatory, the following details are the more necessary, as shewing what weight may be attached to the observations made with them.

The first thing necessary was to make the cistern perfectly mercury-tight, which has been completely effected by a stuffing of tow and glue round the boxwood cap, the cap having been filed to a level (inwards) sufficiently to allow of a wrapper of the above materials being applied and pressed down by an iron tool from above—next, the instrument being inverted, a hole (*ef*) bored in the lower chamber and a fine screw tapped into it; a supply of mercury was then introduced, and the cistern being screwed up, the instrument was set by to dry for some days, after which, the comparisons for determining the neutral reading were commenced.

The standard Barometer of the Observatory, with which the comparisons were made, is by Newman, the cistern measures 6 inches in height and three in diameter over all, and about $2\frac{1}{2}$ inches inside, the tube is 5.54 inches in diameter *inside*, and the scale and vernier are of platinum, the former being attached to a brass rod terminating below in a fine ivory point, which is adjusted to the surface of the mercury in the cistern—the scale reads by means of the vernier to the 500th, and by estimation to the 1000th part of an inch, to which limit all the observations are taken.

The following are the values given by Mr. Newman of correction for capacity, &c. of the two portable Barometers attached to this Observatory:—

No. 40—Correction for capacity,.....	$\frac{1}{42}$
For capillary action,	+·042
Temperature,	60° Faht.
No. 44—Correction for capacity,	$\frac{1}{55}$
For capillary action,	+·031
Temperature,	60° Faht.

The Thermometer of No. 44 is broken.

The comparisons were made in the following manner: the two portable instruments were hung up on the same pillar with, and one on each side of, the standard Barometer, and a small excess of mercury having been introduced into the cistern, the escape of a portion was allowed to take place by means of the screw below until the height of the column read approximately the same as the standard, making due allowance for the difference in the capillary action of the two tubes; a perfect coincidence was found impracticable.

The annexed table exhibits the mean daily results of the comparisons which were taken, every two hours at the times appointed for the other regular observations, and embrace therefore the period, nearly, of one complete oscillation; viz. from 10h. 29m. A. M. to 10h. 29m. P. M. inclusive, Observatory mean solar-time, so that each entry is the mean of seven observations, and the mean of the means for No. 40 is deduced from 133, and for No. 44 from 112 comparisons; the differences from the standard are as accordant as could have been expected, considering the imperfect nature of the scale upon which the heights are measured, the difficulty of getting a good contact with the surface

of the mercurial column, and that the daily means combine the errors or *personal equations* of the different observers. It is perhaps superfluous to mention, that the first comparative reading of each portable Barometer has been taken as a Zero, to which all the corrections for capacity have been made, and if the instrument could be read with precision, all the differences from the standard should have come out alike. The differences of the partial results from the final mean are, however, generally within the limits of the probable error of observation, and the latter may therefore be considered as correct an approximation as could, under the circumstances of the comparison, be obtained, and certainly sufficiently so to warrant the use of the instrument in the determination of altitudes, comparatively with the Observatory standard, to which, provided the cisterns remain mercury-tight, they will now be immediately applied. The results of those observations will be communicated hereafter.

Table of the mean daily comparisons of Portable Barometers, Nos. 40 and 44, with the Observatory standard, No. 40.

Days.	Standard.			Portable Barometer No. 40.						Portable Barometer No. 44.					
	Height of Column +003.	Therm.	Height of Column +042.	Therm.	Diff. from first reading.	Correction for capacity 1-42.	Corrected read- ing.	Diff. from stan- dard.	Height of Column +031.	Therm.	Diff. from first reading.	Correction for capacity 1-55.	Corrected read- ing.	Diff. from stan- dard.	
0	23.336	0	23.306	0	0	0	0	-030	23.343		0	0	0	+007	
1	23.315	61.6	23.271	61.9	-037	-009	23.260	-052	23.324		-010	-004	23.320	+004	
2	357	62	316	62.1	+010	+002	318	-041	365		+022	+004	369	+012	
3	333	62.1	289	62.3	-017	-004	285	-048	335		-008	-002	333	+000	
4	339	62.6	300	63.0	-006	-001	299	-038	346		+003	+001	347	+006	
5	308	61.7	272	62.0	-034	-008	264	-044	316		-027	-005	311	+003	
6	261	61.3	220	61.5	-086	-027	193	-068	264		-079	-014	250	-011	
7	285	60.7	232	61.3	-074	-018	214	-071	289		-054	-010	279	-006	
8	394	60.1	348	60.5	+042	+010	358	-046	396		+053	+010	406	+014	
9	404	60	354	60.2	+048	+012	366	-028	407		+064	+012	419	+015	
10	386	59.7	347	60.1	+041	+010	357	-029	394		+051	+010	404	+018	
11	386	58.9	348	58.7	+042	+010	358	-029	398		+055	+010	408	+022	
12	429	57.3	380	57.0	+074	+018	398	-031	432		+089	+016	448	+019	
13	399	56.9	353	56.5	+047	+011	364	-035	412		+069	+013	425	+026	
14	354	57.3	306	57.1	+000	+000	306	-048	364		+021	+004	368	+014	
15	408	58	362	57.7	+056	+013	375	-033	418		+075	+014	432	+024	
16	388	58.7	335	58.2	+029	+007	342	-046	394		+051	+010	404	+016	
17	346	59.4	296	59.1	-010	-002	294	-052							
18	320	59.4	280	59.3	-026	-006	274	-046							
19	362	59.2	318	59.3	+012	+003	321	-041						*	
mean	23.356	59.8	23.312	59.9	+006	+001	23.313	-043	23.366		+026	+004	23.370	+011	

Magnetic Observatory, Simlah, 5th Nov. 1841.

* This difference is taken from the mean of the standard for 16 days, viz. 23.359 inches.

It appears from the above, that the mean neutral reading for Portable Barometer, No. 40, viz. 23·313 is .043 of an inch too low, and in No. 44, the neutral reading 23·370 is .011 of an inch too high. The following Examples will explain the method of reducing the observed to the true readings for both instruments:—

Example for Barometer, No. 40.

Suppose the observed reading on the scale to be 22·543 inches, the temperature of the mercury being 49° Faht.—the true height of the column is required.

Observed reading,	$h' =$	22·543 inches.
Neutral do.	$h =$	23·313
Difference,	$(h'-h) =$	<u>-0·770</u>
Correction for capacity,	$\frac{1}{42} (h'-h) =$	-0·183
Observed reading as above,	$h' =$	<u>22·543</u>
True height of column, $H. = h' - \frac{1}{42} (h'-h) =$		22·360 inches.

Example for Barometer, No. 44.

Required the true height of the column of mercury, the observed reading on the scale being 25·291 inches and the temperature of the mercury, 64° Faht.

Observed reading,	$h' =$	25·291 inches
Neutral ditto,	$h. =$	28·370
Difference,	$(h'-h) =$	<u>+1·921</u>
Correction for capacity,	$\frac{1}{55} (h'-h) =$	—·349
Observed reading as above,	$h' =$	<u>25·291</u>
True height of column, $H. = h' + \frac{1}{55} (h'-h) =$		25·640

A correction would also be required for temperature, but with instruments of this construction, *i. e.* as to relates to their scale, the reduction in this account is impracticable.

Observations of Meteors, on the night between the 12th and 13th November 1841, made at the Magnetic Observatory at Simla. Communicated by Captain J. T. BOILEAU, Engineers, F. R. S. &c. &c. Superintendent.

The observed recurrence of numerous meteors on the same night, during a series of years, having led to a belief in their periodicity; it has become a special duty at all the fixed Magnetic Observatories to watch for their appearance, on the dates in question; the nights of the 10th August, and of the 12th November, have afforded the most remarkable instances of their recurrence, both as regards their number, and the regularity of the phenomenon. Our labours here, on the former night, were fruitless — not a single meteor having been visible; but the following account of those observed on the night between the 12th and 13th instant, confirms the fact, as regards the latter date. It is to be hoped, should similar observations of these meteors have been made in other parts of India, that an account of their appearance may be forwarded for publication, in the Journal of the Asiatic Society, *without delay.*

Night between the 12th and 13th November, 1841. By 3rd Assistant C. NUTTALL.

8 : 15 P. M.—Brilliant meteors, to N. Motion moderate, direction from near the Pole-star perpendicularly downwards.

11 : 10 P. M.—Meteor NE. by N. altitude 1st appearance 30°, direction downwards.

11 : 15 P. M.—Meteor over head, direction downwards.

By 1st Assistant J. B. GRIENTHWAITE.

2 : 55 A. M.—A few luminous patches appeared from E. to N.E. at an elevation of about 30°. At 3h. 02m. A. M. they became more brilliant, and light was apparently pulsating through them; at 3h. 08m. assuming a dull appearance, they disappeared.

3 : 30 A. M.—Two dim meteors from Zenith downwards, direction N.E.

4: 25 A. M.—Five bright meteors passed rapidly from Zenith vertically downwards, N.E.

By 2d Assistant W. CRAIG.

On proceeding to the Observatory about 4: 25 A. M. perceived a shower of meteors, and after taking the regular observations, recorded meteors as follows; viz.

1. From Zenith downwards, S.
1. Ditto ditto S. altitude of first appearance, 50°.
1. Ditto ditto E. ditto ditto, 40°.
1. From E. nearly horizontal to S.E. „
1. From N.E., direction E., altitude of 1st appearance, 50°.
1. From Zenith towards E.
1. From ditto, direction downwards to S.W.

The 2d Assistant observed in all about 30 meteors, chiefly in the above directions, but did not record them individually.

By Captain J. T. BOILEAU, Engineers, Superintendent, at Strawberry-Bank, about 800 yards E. of the Observatory.

- 4: 50 A. M.—1. From α Hydræ, S.S.E. vertically downwards.
- 4: 55 A. M.—1. Through Corvus ditto ditto.
- 5: 03 A. M.—1. Between γ and λ Argus, small, ditto.
- 5: 05 A. M.—1. Through middle of Auriga, N.E. to S.W.
- 5: 06 A. M.—1. From near α Leonis downwards E.
- 5: 08 A. M.—In Argus as above, vertically downwards.
- 5: 11 A. M.—1. From near Procyon S. vertically down.
- 5: 13 A. M.—1. Near γ Columbæ, S. downwards.
- 5: 25 A. M.—1. Very small from α Leonis towards S.E.
- 5: 26 A. M.—1. Between α and β Cassiopeæ downwards N.N.E.
- 5: 32 A. M.—1. Very rapid from Cancer through Gemini and past β Persei.
- 5: 41 A. M.—1. Very faint from near Sirius downwards W.S.W.
- 5: 45 A. M.—1. Faint downwards N.N.E. from between ξ and η Ursæ Majoris.

Day-light interrupted further observation, though faint lines were occasionally observed as of the passage of meteors, for sometime after the day had well dawned. The night was remarkably clear, free from clouds, and calm, and stars were particularly bright:—one meteor only was observed on the evening of the 13th November, and none had been seen for many nights before the 12th.

During the time of the luminous appearance observed in the N.E. mentioned above, the underwritten readings of the Declination Magnetometer, were taken. The scale readings of the instrument had been gradually increasing for nearly an hour previous to the phenomenon noted, and at the moment of its occurrence, a gradual decrease began to take place, and continued until the disappearance of the patches.

At 2:45 A. M. Scale reading of Declination Magnetometer, 156.

3:00	Ditto,	ditto,	155.9
3:15	Ditto,	ditto,	155.8
3:30	Ditto,	ditto,	155.4
3:45	Ditto,	ditto,	154.7
4:00	Ditto,	ditto,	154.2

The two latter readings being lower than any observed at these times of the day, during the month. The change of reading indicates a movement of the north end of the declination needle, West, through an arc, not taking the torsion of the suspension thread into account, of $1' : 13''$ —the arc value of the scale being .676' for each division. The horizontal and vertical Force Instruments remained steady during the above period.

*On Porcelain Clay found at Mangalore. By A. T. CHRISTIE, ESQ.
Madras Medical Service. Communicated by Government.*

In compliance with the instructions of the Honourable the Court of Directors, conveyed to me in a letter from their Secretary, before I left England, to report proceedings to the Government of Fort St. George, I have now the honor to furnish an outline of my researches since my arrival in this presidency.

In proceeding from Mangalore by way of Cannanore, Tellicherry, and through Wynaad to the Neilgherry Hills, I had an opportunity of examining the geological structure of the country along that line of road.

The country on the coast, and probably extending to the foot of the Ghauts, consists entirely of the ferruginous claystone formation, which has been described by Buchanan, under the name of laterite. It rests upon granite and gneiss, which make their appearance in the beds of many of the rivers, and very frequently on the sea coast. The laterite is of little importance in an economical point of view, except as a building stone; but is interesting when studied in relation to the phenomena of springs, the nature of soils, and its general effects upon vegetation, to all of which subjects I propose hereafter to devote my attention. As far as I had an opportunity of examining the other formations, they appear to yield no mineral products of any value.

A few miles to the north of Mangalore, and in connection with the laterite, I discovered an extensive deposit of pure porcelain clay, very closely resembling that of Limoges in France, of which the beautiful Sevres-ware is formed. I need not point out the importance of this article. Being found close upon the coast, it might be easily shipped, and sent home as dead weight, or with the assistance of Chinese workmen, it may hereafter become an article of manufacture in India. I also found it in considerable abundance, and nearly of equal purity on the Neilgherries.

The whole of Wynaad consists of primitive rocks, with a few patches of laterite in certain situations, and great deposits of diluvium. In the latter (which consists principally) of a reddish clay, with imbedded fragments of gneiss, granite, and quartz, gold is found. On the road between Nellival and Goodaloor, I observed some shal-

low pits in the diluvium, and remarking the similarity between this deposit, and those in which gold is found in other parts of the world, I made enquiries of the natives respecting it, and ascertained that they procured gold here by washing in the rainy season. Having seen no geological account of the gold works in this part of India, I am not aware whether this metal has yet been found in its original matrix, or whether it is wholly derived from this loose transported deposit, or diluvium, as geologists call it. The latter forms a succession of low rounded hills, which are intersected by streams, and are every year partially worn down by the rains, which is perhaps the origin of the river gold of these districts.

The Neilgherry hills are entirely composed of primitive rocks, consisting principally of granite, gneiss, a large quantity of earthy felspar, quartz, and a peculiar rock, which I would name corundum rock, from its having that mineral as one of its principal ingredients. I have met with nothing analogous to it in Europe, and it occurs in great abundance ; many of the hills being entirely composed of it.

Some interesting questions connected with the parallelism and elevation of strata, and other branches of theoretical geology may derive elucidation from a more minute survey of the Neilgherries, and the neighbouring country ; but as these are not suited to a report of this nature, I must reserve them for the memoirs I hope to be enabled to publish at some future period on the geology of India.

The climate and agricultural features of the Neilgherries are more interesting and more worthy of attention than their geology. These hills, rising in the middle of the torrid zone, to the height of nearly 9,000 feet, present every variety of climate, from that of the plains of India to that of England. The climate of their higher parts resembles that of the great intertropical cities of South America,* which have become the centres of civilization in the new world ; but is superior in one point of view, being never subject to those sudden changes and cold piercing winds, which are occasioned by the vicinity of lofty mountains, some of which are capped with snow. The mean temperature of Ootacamund is rather more than that of London,

* Quito is about 9,000 feet above the level of the sea ; Santa Fe de Bogota, 8,000 feet ; Mexico about 7,400 ; and Caraccas nearly 3,000 feet. Although the latter place has been called an earthly paradise, its climate is changeable and unhealthy.

but its annual range of temperature is very small, and it may be said, that the season of spring reigns throughout the year ; yet, though there be no winter, the heat is never sufficiently great to bring the more delicate Europe fruits to perfection, and at this height we can only expect the successful cultivation of corn and of vegetables. The valleys, which have a height of from five to six thousand feet, enjoy the climate of Italy, the climate of the vine, the olive, the orange, and the mulberry. The tea tree is cultivated in China between the latitudes of 27° and 31° in a hilly country, and consequently in a climate probably of 70° to 73° of mean temperature. Such is nearly the mean temperature of the valleys in the neighbourhood of Kottagerry, and of many others along the Eastern and Northern faces of the hills. The cultivation of this valuable plant might therefore be attempted here, and with a much better chance of success, than in almost any country beyond the limits of China. A little lower down than this, coffee might be produced ; its native habitation being on the sides of the lofty mountains of Yemen, and nearly in the same latitude as the Neilgherries.

But with all these advantages of climate, there are certain peculiarities, which in some situations prove most injurious to vegetation, and if overlooked in any schemes for the improvement of agriculture or horticulture in these regions, might mar our best exertions. These are ; 1st, the great intensity of the solar rays when the sky is not obscured by clouds ; 2d, the great waste of heat from the ground and from plants by radiation in clear nights. The former will sometimes produce a heat of from 90° to 100° on the surface of leaves, flowers, and fruit during the day ; the latter may subject them, in the succeeding night, to a degree of cold considerably below the freezing point. Few plants will bear so great a transition, and it is only to be avoided by a judicious selection of situations, which are not likely to be much under the influence of the two causes I have noticed ; or in the case of fruit trees, and garden plants, by matting and other contrivances. I need scarcely remark, that it would be highly desirable to ascertain the meteorological characters of the different parts of the hills, before attempting the introduction of any new staples ; otherwise, in a new country, and without experience, success would be very questionable, and would rest only upon blind chance.

Next to the climate of a country, the most important object an agriculturist has to turn his attention to, is the nature of the soils. One of the most remarkable features of the Neilgherries is, the great depth of soil met with, even on the highest hills. It has originated principally from the disintegration of the earthy felspar mentioned above, which is more or less mixed with sand, is coloured with iron, and in some situations, contains numerous pebbles and small fragments of quartz, and of the other subjacent rocks. In some valleys, it contains a certain quantity of vegetable matter; and in many places on the higher hills, a thick coat of black vegetable stuff is found principally formed of decayed ferns, and which might perhaps be usefully employed for the amelioration of other soils. The ground is, in general, easily worked, but being (as far as I can at present judge) entirely deficient of lime and of every description of salt, it will probably, for certain kinds of cultivation, require to be highly manured, either with lime, with salts, or with vegetable and animal composts. Lime is clearly indicated as a manure for the Neilgherry soils; but the very circumstance which renders it so necessary; viz. its total absence among the subjacent rocks, makes it difficult to be procured. The lime which is employed in building is obtained from the kunker, (calcareous tufa,) which occurs in great abundance all over the plains of Coimbatore; upon analyzing it, however I have found it to contain a considerable quantity of magnesia, which renders it totally unfit for the purposes of agriculture, nothing being so injurious to vegetation as that earth. Were the distance, not too great, shells might be brought from the coast to improve the soil, and sea salt, and nitre, neither of which are very expensive, might prove useful.

I need not insist on the inducements that these, and some of the other hills further South* hold out to English enterprise; since the government have already by their many liberal and enlightened measures for their improvement, shewn themselves perfectly confident of the immense advantages that must hereafter be derived from them. I am led to hope, therefore, that I shall only meet the wishes of the government, when I humbly beg leave to suggest, that I may be permitted to devote part of my time to a more minute survey of them, so as

* The Pyney and Vunhoggerry mountains, which have probably an elevation of from 5,000 to 7,000 feet above the sea.

to enable me to exhibit an accurate exposition of every thing connected with their physical geography, such as the height of their principal summits, the general height, form, and direction of their valleys, the climate of their different parts, the characters, and composition of their soils, the nature of their springs and streams, their vegetation, and their geology. With this view, I could establish my head quarters on the Neilgherries; for under any circumstances, it will be necessary for me to have a fixed residence, where I may leave my books, apparatus, and specimens; and as long as I continue in the South of India, the situation of these hills will be sufficiently central for this purpose.

After having remained several weeks on the Neilgherries, I came to Madras by way of Trichinopoly and the coast, in expectation of finding some secondary formations near the former place. In this, however, I was disappointed, and found that part of the country to possess but little geological interest. On the coast I was more fortunate, having discovered several curious deposits containing fossils, which are calculated to throw some light on the geological epochs of the Indian formations.

Since my arrival in India, I have made considerable collections in Zoology, and have procured some very interesting specimens of fresh water-fish, crustacea, and insects. These it will be impossible for me to describe, while engaged with my various researches in India. My time while in this country, must be chiefly occupied with collecting materials, which can be only arranged and described on my return to Europe.

Descriptions of three Indian species of Bat, of the genus Taphozous.

By EDWARD BLYTH, Curator to the Asiatic Society.

Of the several well-defined generic forms presented by the Insectivorous Bats, a perfectly distinct one exists in the *Taphozous* of the Chevalier Geoffroy St. Hilaire, or *Saccopteryx* of M. Illiger, which was founded by the former eminent naturalist upon a species discovered by him in the catacombs of Egypt, and which he has figured and described, in the great national French work on that country, by the appellation

T. perforatus; a second African species is considered by him to exist in the *Doret Volant* of Danberton, styled *T. Senegaliensis* by M. Geoffroy; and a third has been discovered in Abyssinia by Dr. Ruppell, who names it *T. nudiventer*; a fourth is described by M. Geoffroy; *T. Mauritanius*; and the *Vespertilio lepturus* of Schreber, or *V. marsupialis* of Müller, said to have been brought from Surinam (which is very doubtful, as the form would otherwise appear to be peculiar to the warm regions of the Old World), and which species (according to Mr. Gray) "scarcely appears to differ" from that first noticed, is recognized as *T. lepturus* by M. Geoffroy, and as *Saccopteryx lepturus*, by M. Illiger. Another alleged American species is the *T. rufus* of Dr. Harlan, founded on the Bat figured in Wilson's American Ornithology, on the same plate with the American Eagle owl; but a glance at this figure is quite enough to shew that the animal belongs to a widely different genus of Bats, and it is supposed by Mr. Gray to be not improbably the *Vespertilio pruinosus* of the late accomplished American naturalist, Mr. Say, which Mr. Gray refers to *Scotophilus* of Dr. Leach, (synonymous with *Nycticejus* of M. Raffinestque). The *Taphien filet* figured in the work on Egypt, is the type of the distinct genus *Rhinopoma*, and is stated to have been termed a "Taphien" on the plate by mistake. The only Indian species which has yet been described, to my knowledge, is the *T. longimanus* of the late indefatigable Major General Hardwicke, of which a description and plate are given in the fourteenth volume of the Linnæan Transactions, (p. 525). This is mentioned as being "common in Calcutta, in dark store-rooms; at night it frequents habitations, attracted by the light of the candles and numerous insects." Finally, in the valuable "Catalogue of Mammalia inhabiting the Southern Mahratta country," published in the Madras Journal of Literature and Science (Nos. 24 and 25), by Walter Elliot, Esq., we are informed that "only one specimen of *Taphozous* was obtained, of which the description has been lost." (p. 99.)

The members of this group are distinguished by a conically-shaped head, flattened on the face, and having a large and deep circular concavity between the eyes; the nostrils are small and terminal, approximated, and capable of closure at the will of the animal; the ears are widely separated, somewhat triangular, and broad at base, a fold of skin being continued from the base of their upper and fore margin to the border of the

frontal depression above the eye, and another forwards from the lower margin, which is furnished with a lobe corresponding to the "drop" of the human ear, only it is not pendent, and the base of it is even with the mouth; the conch usually lies flatly outwards, the anterior margins of the two ears forming a straight transverse line, and their medial part collapses into plaits, which are obliquely transverse with the tip, as is more particularly noticeable in the living animal; within the conch is a short hatchet-shaped tragus, nearly as broad again at the extremity as at the base. The wings in this genus are long and rather narrow, the short thumbs being furnished at base with a small and slightly flattened cartilaginous cushion, which is more or less observable in other Bats, and is only more developed in certain *Dysopodes*, or (according to Mr. Gray) the young of these, supplying the trivial character upon which Spix founded his subdivision *Thyroptera*: the innermost digit is connected at base to part of the fore-arm by a small internal membrane, forming a little sac, whence the name *Saccopteryx* of M. Illiger. The tail of these Bats is more or less elongated, and is enveloped at base in the interfemoral membrane, from the upper surface of which, about half way from its margin, the extremity protrudes in proportion as the membrane collapses, to a variable extent (apparently) in different species, curling round backwards and upwards in the attitude of repose, and becoming sheathed as the membrane is expanded. Another curious character, more or less developed in the different species, and chiefly in the males, consists in a large gular sac, the orifice of which is anterior and transverse; on the chin are two slight, parallel, and nearly contiguous, longitudinal folds of the skin (which in certain species, are rudimental), each subdividing into two smaller folds posteriorly, the channels between which lead to the sides of the throat-sinus; the interior of the latter would appear to be glandulous, though I have been able to perceive no trace of secretion. On the middle of the upper lip is a slight duplicature; and the top of the lower lip is conspicuously reflected, having a mesial groove; the mouth is cleft to beneath the forepart of the eye. These animals, according to Cuvier, have one pair of upper incisors, though often none, and the latter is the case with five specimens before me, appertaining to three species; they are probably pushed out by the growth of the permanent canines (as in various other Bats), which of course follows after some time the renewal of the properly deciduary, or "milk"

incisors, and therefore may be of some utility for a time, co-existing with the first canines, but no longer required when these are supplanted; in the lower jaw are four distinctly trilobated incisors: behind the upper canines are one or two very minute false molars, then a large sharp pointed one, corresponding to the *carnassier* or "scissor-tooth," and posterior to this are two large subquadrangular true molars, less elevated than the last, and succeeded by a small transverse third true molar; below are two large pointed false molars, and two large and one small true molar, corresponding to those above. The fur is soft, close, and velvety, and in most species plentiful, being generally, if not always, slightly grizzled towards the extremity of the pile.

The first species I have to notice is the

T. longimanus, (?) Hardwicke: but as the details furnished by that observer are, for the most part, of generic rather than specific import, it may prove to be an allied one, though I do not think this probable. The only specimen I have seen is an adult male, for which I am indebted to my valued friend, and former European acquaintance, Dr. Cantor, in whose residence in Calcutta it was captured. The description and figure are taken from the recent animal.

Length, from nostrils to end of tail, $4\frac{3}{8}$ inches, the membrane extending $\frac{7}{8}$ inch further; alar expanse 16 inches; tail 1 inch, capable of protrusion $\frac{3}{4}$ inch, and of being sheathed for its whole length; ears, posteriorly $\frac{5}{8}$ inch, or anteriorly to inferior lobe even with the mouth, above $\frac{7}{8}$ inch, their breadth at base $\frac{5}{8}$ inch, and tips apart as they lie flatly outwards, $1\frac{3}{4}$ inch; tragus $\frac{3}{16}$ inch, and of the usual hatchet-shape, widest at the extremity. Length of fore-arm $2\frac{5}{8}$ inches, and from wrist to end of wing above $3\frac{7}{8}$ inches; tibia 1 inch, and foot minus the claws, $\frac{1}{2}$ inch; two small longitudinal excrescences on the chin, but no throat-sac in the specimen, though the site of this is indicated by a semi-nude rudiment of the structure in question. Colour of the fur uniform dark fuscous-brown above, slightly tipped with a lighter colour, and pure white at base; beneath paler, except on the throat, from being more conspicuously tipped with brownish-grey; the fur everywhere very close and full, rather short, and soft, and velvety; face almost nude, and with the membranes darker than the back; the ears, as usual, naked externally, except at their posterior base, and on a fold near this; within are a few minute hairs.

General Hardwicke's animal is stated to have measured " $\frac{9}{10}$ inch between the ears," though it is difficult to understand where he fixed the boundary of their bases; but raising the ears, for they naturally lie flatly outwards, (as in the *Rhinopomata* and *Dysopodes*,) the distance between those of my specimen scarcely exceeds $\frac{1}{2}$ inch, and as General Hardwicke's Bat was only "5 inches long, and $14\frac{1}{2}$ inches in extent of wing," I doubt whether a greater interspace existed between its ears than in the subject before me, notwithstanding the figure given, which has doubtless passed through the ordeal of a native artist, in addition to that of the engraver. "The body," he says, "is thickly covered with a very soft hair, in the adult of a snuff brown; the legs, wings, and membranes black: but the full-sized young are of a deep black on all parts." To this I will add, from his Latin quasi definition of the species, "*supra ex fusco rufescens, subtus pallidior*," and what remains is wholly of generic application. The absence of any notice of a throat-sinus adds negatively to the probability of the specimen before me being correctly referred to *T. longimanus*; while, on the other hand, the whiteness of the base of the fur, which is conspicuous when that of my animal is ruffled by handling, is not a likely feature to be quite overlooked. However, if it should prove to be the only Calcutta species, or the only one at all numerous in this district, our doubts may be pretty safely set aside about the correctness of the identification.

T. fulvidus, Nobis.—Of this species I found two males and a female preserved in spirits in the Museum of the Asiatic Society, but cannot learn where they were obtained; though I have been informed that it is common at Darjeeling. It is smaller than the last, with proportionally smaller ears, a deep throat-sinus, and fur pale fulvous-brown at base, grizzled towards the extremity with darker-brown, the extreme tips whitish: some have the nape and interscapular region ungrizzled fulvous, and the under-parts are more slightly grizzled than the upper: face very pale, and membranes also of a light colour.

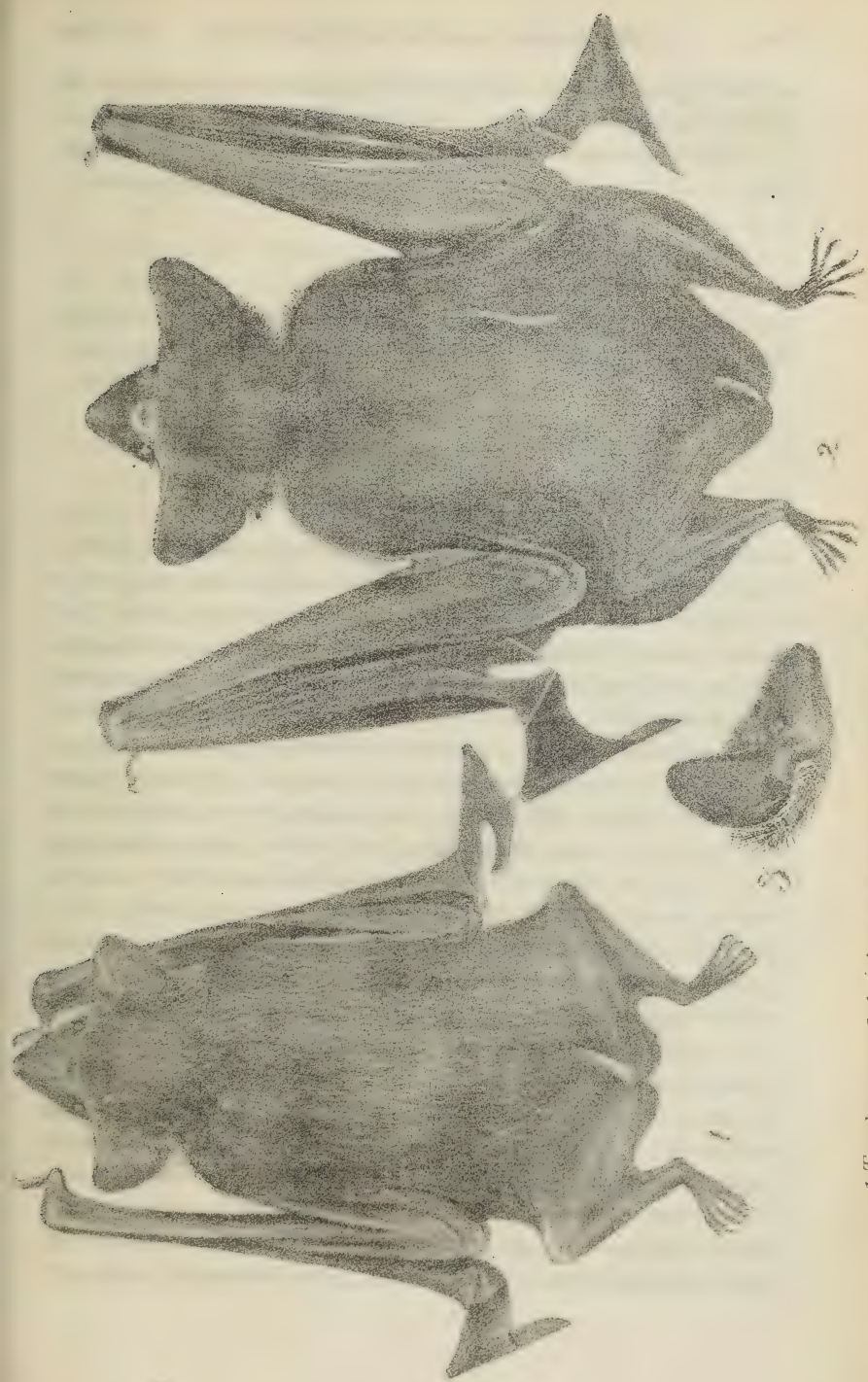
Length of the finer male $4\frac{1}{8}$ inches from nostrils to tail-tip, the membrane extending $\frac{3}{8}$ inch further; alar expanse $13\frac{1}{2}$ inches: length of the female, to end of tail, $3\frac{5}{8}$ inches, and alar expanse 13 inches. Tail (of the male) 1 inch, of which half would seem to be enveloped in the membrane and incapable of protrusion, nor does much of the remainder appear to be capable of being sheathed when the membrane is ex-

tended ; though this may perhaps be owing to the parts having become rigid by lying in spirits : ears, posteriorly, $\frac{3}{8}$ inch, and anteriorly, to the lobe even with the mouth, $\frac{5}{8}$ inch ; their breadth at base $\frac{3}{8}$ inch, exclusive of the duplicature of skin over the eye ; and tips apart, as they lie flatly outwards, $1\frac{3}{8}$ inch : length of fore-arm $2\frac{3}{8}$ inches, and from wrist to extremity of wing $3\frac{5}{8}$; tibia 1 inch ; and foot, minus the claws, nearly $\frac{1}{2}$ inch : beneath the nostrils is a duplicature of the upper-lip, (rudimental in the preceding species,) divided except in front, and merging laterally into the inner surface of the lip ; under-lip reflected as usual : the throat cavity fully developed, but rather less so in the female : colour of the fur as described.

T. brevicaudus, Nobis.—For this species I am indebted to the kindness of Dr. Coles of Madras, who presented to me, for the Society, a collection of skins of Mammalia obtained at Travancore, among which was a single specimen of this Bat, which is at once distinguished from its known congeners by the shortness of its tail.

Length, from nostrils to end of tail, about 3 inches, the tail $\frac{5}{16}$ inch, and entirely enveloped in the membrane, though perhaps merely sheathed in it, and capable of some protrusion ; the membrane extends considerably less backward beyond its tip than in the others : alar expanse about 13 inches, or perhaps rather less : ears posteriorly, $\frac{1}{2}$ inch, or anteriorly, as in the others, $\frac{5}{8}$ inch ; their breadth at base $\frac{1}{2}$ inch ; and distance of the tips apart, as they lie flatly outwards, $1\frac{1}{2}$ inch. Length of fore-arm $2\frac{1}{2}$ inches, and from wrist to end of wing $3\frac{5}{8}$ inches ; tibia nearly $\frac{7}{8}$ inch, and foot, exclusive of claws, under $\frac{3}{8}$ inch. No sign of throat-sac in the specimen, and the merest trace of the excrescences under the lower jaw. Fur dingy-white for the basal half, the remainder dusky-brown with light brown at the extreme tips, which last is more developed on the under-parts. Membranes apparently pale, and face dark.

In conclusion, let me avail myself of the present occasion to request from those who may be interested in the elucidation of Indian Zoology, to lose no opportunity of securing specimens of as many species of Bat as fall under their observation ; these should be placed in spirits (though not too many in the same vessel, or they speedily decompose) ; and in the present state of our knowledge respecting the species inhabiting India, it is desirable that many examples of each kind should be preserved for distribution to different Museums, by which means a certainty of



1 *Taphoxenus fulvidus*. 2 *T. longimanus*; 3 Head of do.

the correctness of the names attached to them can be ensured, and the value of the specimens thus enhanced. At present, the Museum of the Asiatic Society is sadly deficient in species of this interesting family.

December 5th, 1841.

Extracts from a Report on subjects connected with Afghanistan. By
DR. GRIFFITH. *Communicated to the Editor, from the Political*
Secretariat of India.

PART III.

NATURAL PRODUCTIONS.

Wild Animals.—None of the wild animals of the country appear to be of any considerable importance. They are comparatively speaking, few in number, and none attain any large size. The most important from their size, and probably from numerical extent of individuals, are the wild sheep and wild goats, of which last there are probably three distinct species, at least, in the country. The chase of these animals for their flesh, which is, I believe, held in considerable estimation, both by Europeans and Afghans, is attended with considerable difficulty and exposure, and is principally confined to the winter months, during which these animals are forced to take up lower ground. The animals of the above nature known to me are,—

1st. The Wild Sheep, *Ovis Argali*?—The only specimen of this I have seen alive was in the possession of Captain Ferris, at Peshbolak. With the head and barrel of a sheep, it had the legs, the muscularity, and activity of the antelope kind. Nothing can be imagined greater than the agility and sure-footedness with which it would gallop along the top of the narrow ramparts of an Afghan fort, and precipitate itself down from its bastions. It was perfectly tame, and naturally gentle; and seemed to prefer Europeans to Hindoostanees. In choosing its companions and females, it was by no means select, and appeared quite capable of pleasing a whole flock of ewes and she-goats. I regret to say, that perhaps from want of any very great affinity between the species, no marked breed has resulted from this extensive crossing.

Of wild goats, I believe I have seen portions of two species, one of which was sent me by Captain Macgregor. I have never seen either alive. A species of Ibex also exists, with this I am only acquainted from the horns, which it is the custom to attach indiscriminately to the *Zearuts*, and places of sacred note.

From the forests of Olipore, I procured a species of Antelope of the Goral kind; this is known to the natives of those regions by the name *Suga*. Other species doubtless exist in the dense forests of that part of the country, such, for instance, as the Musk Deer. I also heard of another ruminating animal, which the Olipores called Goomast; but their description was so extraordinary, that I could make nothing from it.

Afghanistan possesses wild Asses, but these are confined to the western and north-western parts of the country.

From the general scarcity of jungle and of animals, the country derives one advantage at least, in the absence of the larger carnivora. Mr. Elphinstone, in his very excellent and extraordinarily accurate account of the kingdom of Cabul, mentions, but with doubt, the existence of Lions in the hilly country about Cabul. If Lions do exist in any part of Afghanistan, they must be looked for, it appears to me, to the West.

Of Tigers.—I did not get any information; for even about Olipore, where the upper part of the hills is covered with forest, the lowermost parts and the sides of the vallies do not present much deviation from the ordinary Afghan nakedness, and this is ill-suited to what we know of the habits of these animals. Leopards exist about Chugurserai, and probably in all the wooded portions of the Sofaid-koh system. A large wild Cat, with a tendency to the Lyncean tuft on the ears, is also met with about Olipore.

A large and a small species of Fox appear to exist. The former, which is perhaps identical with the large Himalayan Fox, I procured from Quettah and at Olipore, at which place it is not uncommon. The small kind seems to resemble the Fox of the plains of N. W. India. Jackalls were observed at Quettah, and in the Koonur valley. Of Wolves and Hyænas I did not hear, although the nature of many parts of the country would appear, from what is known of the habits of the Indian species, well adapted to them. Of this I am quite sure, that if they do exist, their existence must be more than ordinarily

precarious, especially during the summer months, when the flocks are driven far away into the high districts. The other carnivora known to me are the Mongoose, and a small prettily marked animal of the same family, which I saw alive in the possession of an officer of H. M. 13th Light Infantry.

Wild Hog occur in some parts, such for instance as the valleys of Jellalabad and Peshawur; in certain parts of which last, along the Cabul river, they are reported to be numerous. No domestic swine are to be seen in the country, the untravelled Afghans therefore cannot appreciate the reasons which led to their being denounced as unclean. They do not, however, hold them in less abhorrence than the Mussulman of Hindostan, who has daily evidence of their filthy habits. Afghanistan possesses one species of Hedgehog of small size with large ears. It is among the rat-like or rodent animals that the greatest variety in form is to be found. In this direction, as in the Flora, the transition between Afghanistan and India may be observed in the dry parts of our extreme N. W. provinces.

Of these animals two only exist of any size; the largest is the Porcupine, which is to be found in the lower parts of Eastern Afghanistan, and a Marmot of about the size of a Beaver, which I have seen on the mountains about the Hageeguk Kaloo and Erak passes, on which it occurs between 11,000 and 12,000 feet.

It attracts notice chiefly by its loud whistling, but otherwise is a very wary animal; it may be occasionally seen sitting erect on its hind quarters at the entrances to its burrows. Of the smaller rat-like animals, several species exist in the collection: the most striking, from its novelty, elegance of form, and agility, is the Jerboa, which was first seen at Quettah, and was afterwards found to be of pretty general occurrence throughout the moderately elevated parts of the country.

One species of Hare was observed to be tolerably common along the valley of the Turnuk. There are, however, probably two other species in the country, as I observed one in a very different locality among the hills at Targeen, and another among the snows of the Koh-i-Baba. No Rabbits exist: their place is perhaps supplied by a species of Lagomys, not uncommon in rocky ground about Cabul, and perhaps generally between an elevation of 6 and 8,000 feet. By some of the officers these little animals were said to have been eaten as Rabbits.

Although not with strict propriety referable to a division headed Natural Products, which, in the excellent statistical arrangement of that wonderful man, Dr. Buchanan Hamilton, is limited to those things supplied by nature without the assistance of man, I have appended to my brief notices of the wild animals, those of a domestic nature.

Domestic Animals.—These are horses, ponies or yaboos, asses, mules, camels, or dromedaries, oxen, buffaloes, sheep, goats, dogs and cats. On the whole in this branch of domestic property, Afghanistan may be considered as rather rich.

Horses.—The horses are heavy, but are said to be enduring. I suspect that their qualities, as well as those of the Toorkistan horses, have been a good deal overrated. On this point, however, I am not competent to remark, besides Government must be in possession of abundant information, as to their value for Cavalry or Draft purposes. The mode of treatment of horses by the Afghans differs considerably from that in use among us. Afghan horses have their stated and defined meals; with us, food is always before them. I think the Afghan plan is the more natural of the two.

Ponies.—The ponies are chiefly used as beasts of burden, for which purpose the larger and stronger kinds are admirably adapted. These, however, are not easily procurable. Although expensive to feed and keep in good condition, the quickness with which they get over the ground, and the ease with which they surmount the obstacles presented by bad roads, renders them greatly preferable to camels.

Asses.—The native asses are not very fine, but those imported from Turkistan are perhaps among the finest. The males are sent across the mountains, they are generally white, have their nostrils slit, and fetch a high price, say 100 to 120 Rs. at Cabul.

Mules.—Very few fine mules are procurable even for very high sums. Although not so fast as yaboos, which in the hands of Afghan drivers seated on the top of a load of 3 and 4 maunds, will go at the rate of 5 miles an hour for 15 miles; they are more enduring, and much less expensive to keep; on the other hand, they are said to be more liable to be galled.

Dromedary.—The Afghan dromedary is decidedly a very fine animal, remarkably different in general configuration from that of Hindoostan, having a round, handsome, and compact barrel, and short

strong legs. The outline of the head and face are very different, and the upper lip is much less pendent. The under-hair or wool of the dromedary affords excellent materials for warm, strong, and cheap clothing, and the Afghans avail themselves largely of it. In this country, these animals are always driven, not led, neither are they incommoded with a nose string. Hindoostan camels are not adapted to the climate of Afghanistan, or the stony surface of the country; it was found, that unless as well cared for as horses, they are by no means enduring animals, being exceedingly impatient of cold and wet; and though not great drinkers, impatient of the want of water. Although the Indian camels accompanying the Army of the Indus underwent great hardship, and suffered from change of diet or absolute privation, yet great part of the great loss was occasioned by the cruelty and carelessness of the *surmans* or camel-drivers; than whom, even in Asia, a more worthless set does not exist. Captain Fraser of the Cavalry was one, among the very few officers, who did not lose a single camel between Ferozepore and Cabul. From his experience it would appear, that with good grooming, clothing, and feeding, the Indian camel may be depended upon. Perhaps this may be deemed worthy of some attention. At present the well-being of the carriage of an Army is almost entirely left to the natives, who in addition to their other bad qualities, are merciless and most improvident masters. At Urghundee, I counted about 20 camels, which had recovered after having been deserted and deprived of a large portion of skin containing the mark, which it was necessary to shew to secure compensation. On grooming and clothing I am the more inclined to lay stress, as I am aware that the Government camels always had, whenever it was procurable, a liberal supply of grain.

Camel.—The Bactrian camel is not common in Afghanistan, the cross between it and the dromedary is a remarkably handsome and valuable animal. Of the remaining domestic animals, only the sheep, goats, and one or two breeds of dogs, are worthy of any detailed notice.

Sheep.—The sheep, are all dombas, like the Cape sheep, remarkable for the great development of fat in their tails. To the Afghans they are of inestimable value, supplying them with cheap clothing admirably adapted to the climate, with milk, and the favourite preparation from it, *kroot*, a sort of dry curdle, which did not appear to me at all

palatable, also ghee, and I believe oil. The flesh varies a good deal, but generally was not much esteemed by us. When gram-fed it is, I believe, excellent.

The sheep are very numerous, and are generally the property of the Nomadee tribes, whose character might make us look with suspicion on the alleged innocence of the pastoral lives of old. In the cold weather, so far as I have seen in eastern Afghanistan, they are congregated in the low districts; at this season I have seen vast flocks about Lalpore and Dukka. At the commencement of the hot season, they are driven to the high grounds, such as the Hazarah country, between Cabul and Bameean. Each flock appears to be generally led by a goat, to whose movements the sheep pay implicit attention.

Goats.—Goats are also numerous, and perhaps equally worthy of attention, their wool is used largely; and appears to be a promising article. These and the sheep are the only animals that could derive sufficient nutriment from the Afghan mountains, which generally speaking, are remarkably deficient in grassy vegetation. I think they feed principally on the aromatic and thorny plants, which form the principal mass of the vegetation.

Dogs.—The common dog of the country appears to approximate a good deal to the Pariah of the plains. But the Tajee grey-hound, a large handsome animal with exceedingly long curly hair about the legs and ears, (I speak of the animal as I have seen it at Cabul in the summer,) might be introduced into England perhaps with advantage. Although doubtless much less speedy than the high-bred English grey-hound, in their *bone* they may be found to possess advantages which it might be desirable to transfer; the Afghans are also said to possess excellent pointers, but of these I have no personal knowledge.

AGRICULTURAL PRODUCTS.

Of the cerealious or culmiferous plants, Afghanistan possesses wheat, barley, rye, rice, Indian corn, and millet.

Wheat.—Of these, wheat and barley are the most important generally, although rice and maize, especially the former, constitute a considerable proportion of the summer cultivation. Some of the Ghuzni wheat was considered particularly fine. I sent some of the finest I

could get in India for transmission to England, but am not aware what value was assigned to it.

In connection with this, I may mention, that there is an important remark in Dr. Falconer's report on the Seharunpore garden, on the inferior nature of the albumen of our Indian grains. Government might probably deem it advisable to encourage the transmission of specimens of all the finest sorts from Afghanistan to India; some of those of Candahar may reasonably be expected to turn out well adapted to India.

In endeavoring to effect this highly desirable purpose, the following remark of Dr. Falconer should be kept in view, as a guide to the selection of the finer kinds:—"The body of the seed of the European wheat was formed of a farinaceous powdery albumen, which flew off into a dust on crushing; while the Indian grains were seen to consist of a hard horny-looking albumen, which was broken with difficulty, shewing what English agriculturists call "a sleety body" and indicating a comparatively very inferior grain. Throughout Afghanistan, wheat may be considered as the staple grain of the inhabitants. It is generally eaten in the shape of bread, baked in flat oblong cakes, about an inch thick; the better kind is very light and well flavored."*

Barley.—Barley appears almost exclusively used for feeding horses.

Rye and Oats.—I do not remember rye occurring as a distinct crop; but it is not uncommon, as a mixed one. The same may be said of their oats, but these perhaps are really wild. The greater part of many of the fields about Bamean consisted of oats, but as the grain ripens, and falls out before the wheat is ready for the sickle, the only use it can be of is, as affording straw for winter fodder.

Rice.—Rice occurs extensively about Cabul, the highest elevation at which I have seen it cultivated in Afghanistan is about 7,000 feet. It is all of the wet or *shallee* kind. The only particularly fine rice grown west of the Indus, is that called *shallee bara*, grown near Peshawur. The production is very local and very limited; introduced elsewhere it appears to degenerate into the coarse common kind. It has a long grain, and is of such esteem, as to be among the list of presents between crowned heads of the North-west.

* It is from wheat that the favorite article *fuloodah* is made; this appears to be something analogous to our vermicelli.

Maize.—Maize, or Indian corn, is largely cultivated, especially about Peshawur, where its flour is said to constitute the chief sustenance of the inhabitants. Sorghum and bajra are likewise frequent in the lower parts of the country.

All these enter into other uses than merely giving nutritious grains. The young wheat and barley are cut, and given as green fodder to cattle; this is esteemed especially serviceable in improving condition, and is known by the name of khased. The straw of all is taken great care of, and chopped up into boosa.

The stout stemmed kinds, as Indian corn, sorghum, and bajra, are given entire to cattle, who eat the leaves and the ears; they are stored for winter fodder at least in some parts, and are then cut into small pieces, in this state it is called khurbee. None of the other grains are worthy of notice, the supply being limited, and the product very inferior.

Of leguminous grains, the Afghans cultivate muttur, a sort of chunna, or moong; but I know of none so good, or so extensively useful, as to merit detailed notice. As might be expected, with the exception of muttur (peas), these are confined to the warmer and more tropical parts; all may be observed about Jellalabad.

Oily-seeded Plants.—Of oily-seeded plants, mustard is the one universally cultivated; they have also another species chiefly confined to the lower districts, in these also sesamum, or til, may be met with. The country also possesses linseed, but I have never seen it extensively cultivated.

Sugar.—The only place in which I noticed sugar was in the valley of Jellalabad, where it occurs to some extent. It appears to be the same kind as that in common use throughout the North-west. The chief supply of sugar, which from the fondness of Afghans for sweet-meats must be considerable, appears to be derived from the plains. Coarse sugar-candy, in flat cakes, was procurable in 1840 at Cabul, for one-half to two seers the rupee; a coarse kind of Russian loaf sugar, was common also in the market.

Cotton.—Cotton is entirely confined to the lower districts, a good deal is cultivated about Jellalabad. Two plants are cultivated for their colours.

Madder.—Safflower and madder. The former occurs extensively about Cabul, and is perhaps worthy of a more detailed notice than I

am able to give it. Maddar is confined, so far as I know, to western Afghanistan. About Candahar it is common; it is planted on trenched ground; the green parts are given as fodder to camels; the roots are allowed to remain untouched for two, three, or five years, or even seven, the quality of those dug up early is inferior. The price is, I was told, six Hindoostanee maunds for one rupee. Maddar forms an extensive export to Bombay; it is, I believe, the same species as that cultivated in Europe.

Tobacco.—Tobacco of excellent quality is grown about Candahar, chiefly I believe in the valley of the Arghandab. This again is one of the agricultural products, upon which detailed information, accompanied by samples, is necessary.

Natural Grasses.—No valuable natural grasses occur, it would appear, in Afghanistan, except on the Chummuns. The doab-grass is found throughout, but I do not think it is used by the Afghans. No hay is made in any part of the country I have visited, throughout the poorer and less favored districts, such for instance as the Hazarah country between Cabul and Bamean; the wild plants of the hills are cut almost indiscriminately, and when dry are carried to the villages, and stored on the roofs of the houses and towers for winter use. The various kinds of thistles, the large leaves of the rhubarb, and indeed the whole of such plants as are absolutely not too dry to afford nourishment, are thus made use of.

Artificial Grasses.—To supply the wants of fine natural pasture grasses, Afghanistan possesses very fine artificial ones in lucerne and clover, these are extensively cultivated, requiring no great care, but plenty of water. In the green state, they constitute the greatest, and most valuable part of the food of the cattle, and in the dry state, in which they are twisted into coarse ropes, they are extensively used during the winter months.

The lucerne is the same species as that cultivated in the North-west parts of India and Europe; it occurs throughout the country at almost every altitude.

The clover, which is unlike any of the English cultivated species I remember, is a beautiful, and when in flower, a very fragrant plant, it has long succulent tender trailings, stems, and heads of bluish flowers. It first attracted my notice about Ghuzni; it is common at

Cabul, and about Khujjah, below which I do not remember having seen it. By the Afghans it is not so much esteemed as lucerne.

Of the number of seeds despatched by me, by order of his Lordship the Governor General in Council to the Superintendent of the Seharunpore garden, for transmission to Europe, these two would appear to be by far the most valuable, indeed perhaps the only ones worthy of introduction into Europe. The accounts that have appeared of their success, especially that of the lucerne in Ireland, are particularly interesting, and very gratifying to me.

Vegetables.—In vegetables Afghanistan is very poor, although Mr. Vigne has published a list of the Cabul vegetables, worthy of a Covent Garden market; the whole may I think be summed up in the following list: cabbages, cauliflowers, beet-root, spinages, radishes, carrots, bangs, lettuces, cucumbers, onions, and garlic.

Of these only the beet root and cabbage are worthy of notice. The extensive introduction of good European vegetables would confer a real boon on the country. Sir A. Burnes several years ago introduced the potatoe, but on his return to Cabool with the army, he found they had all been lost.

Flowers.—The Afghans do not appear to be skilful florists; no one of their cultivated flowers is worthy of notice. I remarked at Candahar and Cabul, roses, jessamines, marigolds, pinks, sweet-williams, poppies, larkspurs, stocks, wallflowers, narcissuses, flags and China asters, which last are the handsomest, and of the most varied colours.*

Fruits.—In fruits the country is remarkably rich, and although the Afghans are acquainted with grafting, the perfection to which several of the finer fruits has reached, appears to me remarkable; it certainly is more attributable to the climate, than to any skill on the part of the Afghans; there is every reason for believing, that from the improvements they will become acquainted with from their intercourse with us, Afghanistan will become one of the finest fruit countries in excellence, and variety of product. Should success ultimately attend the praise-worthy efforts of Drs. Royle and Falconer to introduce cuttings, &c. overland, Afghanistan should not be omitted in the distribution. Fruits in this country are of a more important nature than

* Hawthorn trees, and the famous Arghawan, occur in Baber's garden at Cabul. This last is, I believe, *Cercis Siliquastrum* of Botanists.

they are in India, or perhaps most other countries in which they are not generally to be considered as absolute necessities of life. In Afghanistan, however, several kinds assist very largely in the sustenance of the bulk of the population.

Few things can be seen more striking to a person accustomed to India, than the display of fruit in the markets and shops of Cabul; few things more astonishing than their very low prices. Even after the whole army of the Indus had been encamped at Cabul for some weeks, they still continued remarkably cheap.

The Afghanistan list of fruits includes

Apricots (zurd-aloo), two or three kinds,

Peaches (shuft aloo),

Nectarines,

Plums (also bokhara), several kinds,

Bullaces? (aloocoo),

Cherries (aloo waloo),

Apples (saioo), several kinds,

Pears (nass puttee), two or three kinds,

Quinces (bhel),

Pomegranates (unnar), two kinds,

Grapes (ungoor), several kinds,

Musk melons, (khur-booja, gurm),

Sinda ditto, (khur-booja, surda),

Water ditto, (turboozah),

Mulberries (toot), two or three kinds,

Walnuts (char mughz),

Figs (unjeer).

Of these, the most important, as constituting an article of food in large consumption by the mass of the inhabitants, are the common kinds of apricots, plums, grapes, melons, and mulberries.

The best flavoured fruits, and generally they may be pronounced excellent, however disfigured and liable to be bruised, they are by the dirty and rude hands of the Afghans, are the khaisee apricots, peaches, nectarines, most of the grapes, the musk melons, the smaller kind of pear, the large red mulberry called shahtoot, closely resembling the good English mulberries, and the seedless (or bedanah) pomegranates.

Most of these fruits are consumed in the country ; some, such as a large thick-skinned grape, (like the exported Portugal grape), the seedless pomegranate, walnuts, apples, and figs are exported ; but with the exception of the grapes, perhaps, in no great quantity, large quantities of the thick-skinned grapes alluded to are consumed in winter throughout the country.

From many preserves are made, and commonly sold in the bazaars. Some again, especially the apricot, kissmiss grape, fig, and white mulberry are prepared by drying ; the apricot in this state, is, I believe, called goobani. The dried mulberries abound in saccharine matter, and are used to a considerable extent, as is likewise the dried kissmiss or raisin.

The peaches are of large size, and good flavour, but are generally damaged by premature plucking and rough usage, the Afghans not being acquainted with the European niceties attended to in gathering such fruits. Nectarines I did not see, but I was told that they are grown at Candahar. None of the plums are particularly good, and the cherries are much more adapted for preserves, than for eating fresh.

Of the several kinds of grapes, I prefer the kissmiss ; this is a small roundish, seedless, grape, of a greenish colour, tinged with brown when perfectly ripe. Besides this, Afghanistan possesses a very large oblong fleshy purple grape ; a green grape of similar properties, other respects than colour, chiefly kept for winter use and for exportation ; a large highly flavoured round purple grape ; a dark purple round sweet grape, with very large and very small fruits on the same bunch, the small ones being seedless. All these, and I dare say more may be procured at Cabul or Candahar. There is also a very large round sub-fleshy green grape, the *ungoori kuttah*, which is produced along the N. face of the Sofaid Koh, as about the Khujjah district.

The surda melon is, I think, unknown in India ; it is very distinct, apparently both from the musk and water melon, is of an oblong shape, with firm whitish flesh ; it is sweeter than the musk melon, to which I think it very inferior. It must be remarked, however, that it is said only to attain its perfect flavour after having been touched by the frost ; it is in extensive use throughout the earlier winter months.

The seedless pomegranates have a high reputation. I never was fortunate enough to meet with really fine ones.

To the list may be added perhaps the zurishk or barberry, which is generally eaten as a preserve; a sort of bhair called aral; the dried pulp of the sinjit, a species of *Eleagnis*, commonly planted about water-courses in the finer vallies and an *Hippophaee*, which I was told was considered a fruit at Cabul. Date trees, but very few, occur at Jellalabad; this fruit is imported in considerable quantities. Citrons also are common in the Jellalabad gardens. The palm of superiority of fruits is I believe, disputed by Cabul and Candahar. Ghuzni is celebrated for its plums, to which, and to apples, its supply is chiefly limited. The fruit season lasts throughout the summer months; there will of course be some difference between the seasons at Candahar and at Cabul. The earlier fruits are chiefly confined to such stone fruits as cherries and plums. The grand season at Cabul is in August and September. The most widely distributed fruit tree is the common mulberry; this is found everywhere, up to elevations of 8 and 9,000 feet; wherever there is a village, there will be found the white mulberry.

The range of the apricot may be stated as between 3,000 and 8,000 feet, it is also met with higher, but scarcely produces beyond that elevation. I have seen it in the Erak ravine as high as 10,500 feet. Walnuts are, so far as I know, limited to considerable altitude, such as that of Cabul, 6,400 feet.

Pomgranates range from 1,200 to 5,000 feet, at Khujjah; 4,500 feet above the sea, they are said to attain great perfection. With regard to cultivation, I am not aware that any great skill is applied. To the unclouded summer sky, the great dryness of the air during the season, the goodness of the soil, and facilities of irrigation, I am inclined to attribute the good qualities of the fruits. It is scarcely necessary to add, that all the trees are standards. Most, if not all the stone fruits, as well as the apples, pears, and mulberries, are planted as orchards. The grapes at Candahar are planted in trenches, to the north face of which they are confined; in most other parts, they appear to be allowed to scramble over trees.

Introduction of the Afghan fruits into India.—A good deal has, I believe, been said of the probability of the successful introduction of the Afghan fruits into India. But if we look at the opposite peculiarities of the two climates, to speak generally, we are not, I think, warranted in expecting such a result. I do

not wish to disparage such attempts, but it appears to me that in all such inquiries there are certain requisite preliminary considerations to which no attention is generally paid in India. In Afghanistan, we have a considerable increase of latitude, accompanied by a considerable increase in altitude, at least so far as the great fruit districts are concerned. We have a cold or a very severe winter, during which, and also about the vernal equinox, snow or rain falls to a considerable amount, constituting as it were a sort of monsoon. This is succeeded by an almost absolutely dry summer and autumn, during which the sun exercises an unchecked and powerful influence. These two last circumstances are, I believe, essential to the perfection of what we call the later European fruits. In what part of the continent of India can these circumstances be found? We may command elevation, but in no Indian climate known to me can we command a cold winter, a genial spring, and a fine summer. In India on the plains, the spring months are very hot, and the time of ripening of the later and better fruits falls in the rainy season. The Coromandel coast agrees with Afghanistan in the distribution of the rainy and fine months, but in no other circumstance. If we go to the hills, we become exposed to an increased severity of summer rain.

No fruit-bearing plant of Afghanistan can, I think, be reconciled with any success to such extremes. It is curious that Peshawur, which has an Afghan climate, so far as rainy winter months and a dry summer are concerned, does not possess, perhaps, a single superior European fruit. Can we infer from this, that a certain amount of winter cold is required for the attainment of excellence? With Bengal Proper, I would not advise interchanges to be made. If it be considered advisable to introduce the Afghan fruits into the N. W. provinces, which have a very different cold weather and rainy season from those of Bengal, I would beg to suggest that the introduction be carried on from Candahar. I find on referring to my journal, that grapes and musk melons were coming into season about the 15th or 20th June. This is about the period of the setting in of the rains in the N. W. as about Merut; but the smaller amount of cold of the Indian winter, and the greater amount of heat of the spring, would doubtless cause the ripening to occur earlier, so that the fruits would be exempt

from the injuries of rain. If introduction into the Himalayas be deemed desirable, Cabul should be the place of supply, unless there is some unexpected affinity between the amount of solar heat of the spring months these mountains enjoy and that of Candahar. And perhaps attention should be chiefly directed to those fruits that are in full season before the middle of June.

General Nature of Afghan Vegetation.—Before entering on a few brief notices of those vegetable productions which are not cultivated, but which administer to the wants of the people, it may be as well to premise a few popular remarks on the general nature of the Afghan vegetation. No parallel can be drawn between the Afghan Flora and that of India in any part; for even in the lower parts of the country, but very little elevated above the general level of our extreme N. W. Provinces, the Flora of Afghanistan is decidedly peculiar.

Line of transition from Indian to Afghan Vegetation.—The transition commences, as may be said, along the Sutlege: on the Ferozepoor route it is gradual, on that of Shikarpore it is much more abrupt. At Peshawur, which is in north latitude 34° , and about 1200 feet above the sea, it is tolerably mature, still there is an intermingling of Indian species, and this continues, gradually becoming less, until one ascends to Gundamuk.

In Kutch Gundava, the Indian forms are less frequent; indeed it may be said that by the Ferozepoor route the Indian species encroach on the Afghan territory; in Kutch Gundava the Afghan species encroach on the Indian territory.

The Afghan transitional forms are various: Boragineæ, Reseda, Chenopodiæ, Bertholletia, Farselia, Medicago, Butomus, Peganum Harmali, Nerium oleander, Alhagi Marorum? The Indian transitional forms consist of Calotropis procera, certain Amaranthaceæ and Chenopodiæ, certain Saccharineous and Paniceous grasses, Acacia, Arabica, and pudica, Prosopis spicigera and Dalbergia Sissoo.

Proper comparison only with the Flora of the Levant, &c.—To gain a just idea of the Afghan Flora, we must compare it with that of the Levant, and perhaps with the greater part of the basin of the Mediterranean, with which it may be said to correspond in latitude. With the general Flora of Persia it may be regarded as continuous.

Extent of Mediterranean Province.—Few things can be more striking or worthy of comprehensive investigation than this vast extent of the Mediterranean or Australo-European Botanical province. Dr. Falconer told me, that he had ascertained it to prevail a long way to the northward and eastward of Afghanistan; and I have materials for shewing, that it characterizes the country on the N. face of the Paropamisus, between Maimuna and Bamean, and from the mission of Meyendorff to Bokhara, to which my attention was directed by Sir A. Burnes, it is evident that it equally characterizes Bokhara, and the country between it and Orenburgh.

On this subject, I shall enter into details in the purely botanical part of my report, which I shall have the honour of submitting with the arranged collection.

Features of the Afghan Flora.—The striking features of the Flora as compared with India, are the scarcity, generally amounting to absolute want, of indigenous trees, a general poverty in variety of form, the general prevalence of forms characteristic of Southern Europe, the abundance of the large European families, such as cruciferous, umbelliferous, &c. plants, and of those forms of Compositæ known to Botanists as Cynarocephaliæ, and of which thistles may be mentioned as familiar instances; the common occurrence of bulbous monocotyledonous plants, such as Tulips, Hyacinths, Onions, &c. the nature of its grasses, and the scarcity of Orchidleæ and Ferns, which may be said to exist only in Eastern Afghanistan.

The number of aromatic plants, the prevalence of thorny species, and the very general occurrence of the flowering periods in the spring months, are also deserving of notice.

From almost all the forms being what are called European, it follows that no transition in form occurs consequent on variation of elevation, similar to that which has been so much noticed by all travelers in the Himalayas, and other high Indian ranges. In this we are accustomed to associate height with the appearance of forms familiar to our earlier days. In Afghanistan it is not so, and it is remarkable enough, that even the summer Floras of its lowest parts, which have as high a mean summer temperature perhaps as any in the world, are still characterised by a majority of European forms. In high or in low, in hot or in cold situations throughout Afghanistan, forms charac-

teristic of an European climate will be found to prevail. The traveller may pluck roses, pinks, hyacinths, sea-lavenders, kochias, eryngos, catchflies, flags, &c. at an elevation of 1,000 feet, as well as that of 10,000 feet. It would perhaps be difficult to find many generic forms characteristic of altitude.

Ordinary visitors would be likewise much struck with the circumstance, that a total change in the indigenous plants may exist, while there is little or none in those cultivated. Thus at Cabul, where the winter is so severe, and where heavy snow lies for two or three months, and about which not an indigenous plant, common to India perhaps is to be found, he will see Indian corn and rice cultivated with wheat and barley, rice perhaps forming the prevailing crop. We may see at Cabul the rice fields bordered by poplars and willows; the aspen quivering over the nodding rice. This is easily accounted for; an approach to community of temperature may perhaps be found between the summer heat of Cabul, and the winter and spring heats of the plains of India, which may explain the cultivation of wheat and barley. Between the summer heats of the two countries, there is likewise sufficient community to account for the cultivation of rice occurring in both in the summer.

Brief notices on useful Plants occurring wild.—The accompanying list will be found extremely meagre; but in the first place, the great bulk of the vegetation consists of the large European families, among which valuable products in the wild state are not extensively presented; and in the second, it is drawn up from memory chiefly, for even the casual overlooking of the Herbarium, which is requisite to make it more complete, would delay one considerably in the submission of the report, and I may add, there is no probability of valuable information turning up to compensate for this.

Maizurrye (Chamærops).—Among monocotyledonous plants, that of the most use is, I think, the *maizurrye*, of the Khyburs and Momunds. It is a small palm, and appears to be a *Chamærops*; perhaps the same as *C. humilis* of Southern Europe? Should it be distinct, I hope it may be allowed to bear the name of *C. Ritchiana*, after Dr. Ritchie, the only person who has explored the botanical productions of the Khybur Pass. This plant is extensively used in the manufacture of ropes, or strings for the bottoms of charpaiees,

and of the sandals, so universally worn in the Momund and Khybur districts, and perhaps generally throughout lower eastern Afghanistan.

Salep.—Salep is to be found in the markets of Cabul, at a much lower price than in those of the N. W. of India. A species of orchis is common in marshy places, high up among the Huzarah mountains, but I could not ascertain whether it was from this that Cabul was supplied. There is also an *Eulophea* in sand islands of the Koonur river, from which salep may be derived.

Umbelliferous Plants.—Among the dicotyledonous plants, the umbelliferous family holds perhaps the highest rank, as affording valuable wild products. In Afghanistan, most of the fœtid, or aromatic fœtid gum resins, such as opoponax, assafoetida, ammoniacum, sagapenum, will probably be found. Of these the most important is the assafoetida, as it is largely exported, and consumed in the country as an adjunct to cookery. It was first announced as existing in the country, I believe, by Sir A. Burnes; it appears to be of general occurrence on the hilly tracts. Probably it is furnished by two species. At Metah, Captain E. Conolly told me, it was produced largely in the hot country of Seistan. He also informed me, that it was collected in conical pieces of paper, placed over a complete section of the plant, at the junction of stem and root.

Prangos Pabularia.—As famous a plant as the assafoetida, exists in the Prangos pabularia. In Afghanistan, however, it certainly does not merit the reputation which Mr. Moorcroft has recorded it possesses in some parts of Thibet. This plant is not uncommon on the Huzarah mountains, at an elevation of 9,500 and 11,500 feet; but it is not used more, either as summer or winter fodder, than most of the plants possessed of any degree of succulence, of the same districts. It is as I have said, cut indiscriminately with thistles, docks, and a host of others, which would surprize an English farmer; this agrees generally with Dr. Falconer's experience.

Maimunna.—The Maimunna, a Rhamnaeous genus, is held in some esteem for its fruit, which for an uncultivated one, is by no means unpleasant. It is common throughout the lower parts of Eastern Afghanistan; the fruit is a black berry of the size of a black currant, and of sweetish flavor. A much more esteemed fruit, which

is sold commonly in the bazars, is the *Goorgoora*, *Edgeworthia buxifolia*, Fal. This plant was first found by Dr. Falconer about Peshawur, and by him was named after Mr. Edgeworth, a distinguished member of the Bengal Civil Service. Its natural characters are, as it were, intermediate between *Myrsionæ* and *Theophrastæ*, tending likewise towards *Sapotæ*. The fruit is roundish and succulent, about the size of a small marble; it is principally occupied by the seed, which is not eatable. I have not seen it fresh. It is considered heating by the Afghans, and this perhaps is the reason of its being common in the bazaars. The plant is generally a thorny shrub: it is common throughout the lower parts of the hills of Eastern Afghanistan.

Sinjit *Eleagnus orientalis*?—The Sinjit, which is probably the *Eloagnus orientalis*, ought perhaps to have been enumerated among the cultivated fruit trees; it is commonly planted along the banks of water-cuts; and is ornamental from its graceful crown and grey foliage. The dried pulp of the berry is eaten, but it is much too sour for European taste.

Pistacia, *P. Lentiscus*.—The *Pistacia* occurs, Lieut. Sturt tells me, on the Hindoo Koosh, to considerable extent; scattered plants of it are not uncommon throughout the mountainous parts of the country generally. It is a low tree, the seed constitutes the fruit, and is as much esteemed by the Afghans as almonds are by us.

Chilghozeh *Pinus*.—Edible seeds, of a very pleasant flavour, slightly tinged with turpentine, are yielded by the *Chilghozeh*, a species of Pine; the seeds are to all outward appearance exactly like those of the *Kunawur Pinus Gerardiana*. They are eaten in considerable quantities, the supplies being derived from the *Sofaid Koh*.

Umlook.—Another wild fruit is yielded by the *Umlook*, a species of *Diospyros*; it also occurs in some gardens; it is not worthy of any notice.

Schnee.—One of the most celebrated plants in the country for its aromatic and stimulant properties is the *Schnee*, which may perhaps be a species of *Balsamodendron*. It occurs in the *Kojuck range*, nad is to be met with, though not to such extent, on most others.

Rhuwath.—Another famous plant is the *Rhuwath*, or *Rhubarb*, which, as it is also cultivated and in great request, ought to have been arranged with the vegetables. It is the only instance which evinces

the knowledge of Afghans of the value of etiolating or blanching certain plants. I have never seen it, not having been in Cabul in the spring. The wild plant, which, I believe is the original of the cultivated one, is plentiful on the Kojuck range, and also on the Huzarah mountains up to an elevation of 11,500 feet. The leaves of this are used with others as winter fodder, the cultivated Rhubarb might easily be introduced to Simlah, Mussoorie, and Darjeeling.

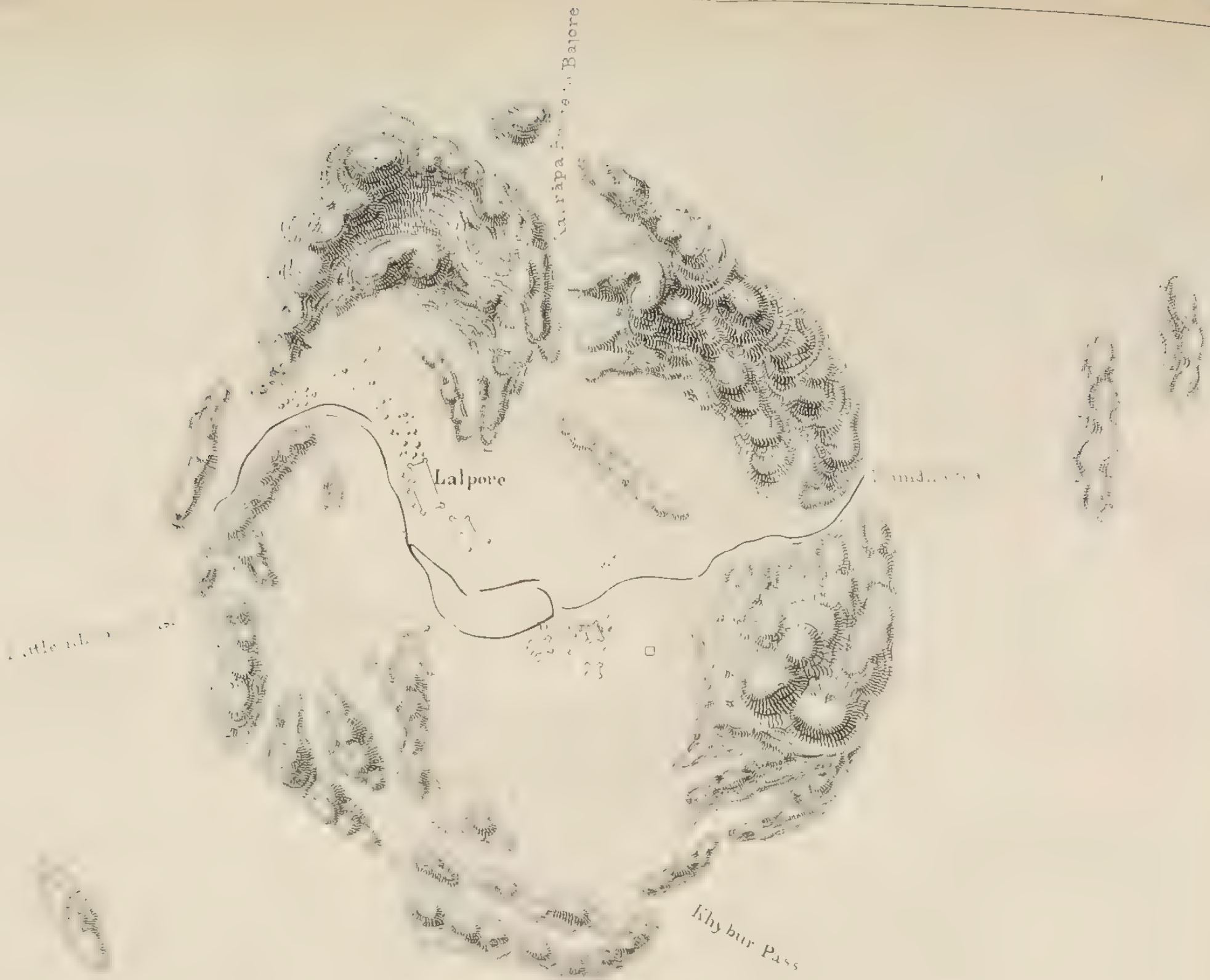
Artemisia.—Several of the wild plants of Afghanistan are extensively used as fuel. Those in most common use about Cabul, are species of *Artemisia* or wormwood, by some of our officers known as wild thyme; they are aromatic, camphorated, low shrubs, and some are eaten by camels. In the loftier districts great part of the vegetable fuel is furnished by the plants known generally by the name of Koollah-i-Huzarah, Huzarah's Cap. They form one of the most prominent features of the Flora, occurring in dense, highly thorny, hemispherical tufts, as unpleasant to touch as the back of a hedgehog. Many species occur. To Botanists they are known by the name of *Statice*.

Ka-ri-Shootur—*Alhagi Maurorum*.—Plants eaten by camels become, in such a barren country as Afghanistan, invested with a good deal of importance. Generally such are not deficient, but one of the difficulties of the Bolan Pass is occasioned by their absence, and to a similar cause I attribute the great loss of camels on the return to India between Bookhak and Bala Bagh. Of these the most esteemed is the *Ka-ri-Shootur*, or *Jaursa* of the N. W., one of the most widely distributed plants, occurring all over the N. W. of India, and all over Afghanistan, up to an elevation of 9,500 feet. This plant is also known as affording the *Turunjubeen*, a sort of manna-like substance; the production of this appears to be local, and the only place I was told it was procured in Afghanistan was the Candahar district.

Perhaps the best other kinds of camel fodder are furnished by the *Chenopodeæ*, or Goose-foot tribe. These abound throughout the country, and are succulent and saline.

Tragacanth.—There is every probability of the true *Tragacanth* plants being found in the country, the section being one of the most common forms of *Leguminosæ*.

Daphne.—A species of *Daphne* not unlike *D. Cannabina*; the paper plant of Nepal and Bootan, is not uncommon at elevations of 5,000



VALLEY of DHUKKA or LALPORE

Scale 2000 yards to 1.03 of an Inch

to 6,500 feet. The Afghans only make use of it in the construction of the matches for their match-locks.

Of the timber trees of Eastern Afghanistan an extensive use is not made; the Baloot suffers most, from being most accessible. The Zaitoon wood is remarkably heavy, sinking in water; it has a very close grain, and may be found to possess valuable properties. On the subject of forest trees, I have entered elsewhere.

PART IV.

It appears to me, that there are three natural defects, of more or less general occurrence, throughout Afghanistan, as that kingdom is now limited; viz. Natural Defects of Afghanistan.—Small portion of tillable soil. small proportion of tillable soil, want of forests, and of water-carriage. Afghanistan is, I think, decidedly a barren and poor country. The tillable part of the soil bears no proportion to that which is untillable.

The untillable majority is composed of either bare rock, the mountainous ranges for instance; or of the inclined planes of boulders and shingle, which I fear must be considered almost as irreclaimable as rock itself.

On the proportions of the tillable to the untillable part, I have no direct observations to adduce. Those proportions are variable, but very generally the irreclaimable parts are in vast excess,* and consequently they oppose a considerable obstacle to any such great extension of cultivation, as would entitle Afghanistan to be considered even a moderately rich agricultural country.

It was a common remark throughout the army, how wealthy the country would be, if stones were a source of richness and prosperity. The stony nature of the country is almost inconceivable by a person habituated to the extensive alluvial soils of British India. It is still more striking, because, owing to the value of the tillable soil, all the roads, with but very few exceptions, are carried over the edge of the glacis slopes; as an instance, and yet it is scarcely an extreme one, I may cite the county between Bala Bagh near Jelallabad, and Bookhak near Cabul, over which the great line of communication with the

* I annex a survey of the valley of Dhukka to shew the proportion of vast excess; the section of the Peshawur valley gives the opposite and more favourable one.

Punjab runs. This distance is scarcely less than 65 miles, and the stones are only varied by the occasional occurrence of patches of dry sand.

These stones and shingle are not merely strewed over the surface of these glacis slopes, but they constitute them entirely, and I do not exaggerate when I mention, that sections may be seen along the course of draining ravines, as much as 60 or perhaps 100 feet in depth.

But although these portions of the country do not appear adapted for any strictly agricultural purpose, there are considerable portions of some of the finer vallies still uncultivated, and it is to these that we must look for extension of cultivation. I shall merely mention such places as presented themselves to my observation; it would be useless to make any suggestions, for a great increase in cultivation has always, and rapidly, succeeded the accession of British supremacy.

Of these vallies I would beg particularly to direct attention to that of Pisheen, in which, on the line of route of the army, I was surprised at seeing so little cultivation. This valley is, if not the largest, among the largest; its general altitude is perhaps 5,300 feet; it is drained by the river Lera, from which the application of the Persian wheel would draw ample supplies for irrigation. The valley is also worthy of examination as to the point of its applicability for a cantonment, instead of that of Quettah, which has, I hear, been found to be decidedly unhealthy. Its extent and openness are greatly in its favour.

When the army was at Candahar, a considerable amount of land both near the city and towards Deh Hajji was found uncultivated. The same remark also applies to the fine and elevated tracts between Mookoor and Nanee. But as in both these instances it was doubtless ascribable to a rapacious and unsteady Government, the tracts alluded to, must already have begun to shew evidences of great and permanent improvement.

PART V.

On contemplating the general resources of Affghanistan, in connection with its physical features, and nature of its inhabitants, it appears to me that there are two directions, which may possibly lead to positive and permanent improvement. I allude to Minerals and to Wool.

Minerals.—With regard to the former, I have to observe, that in the absence of coal, which does not appear to have been discovered, the mineral productions are only likely to become useful in the wooded parts of the country, that is, about the great ranges, Sofaid Koh and the eastern end of Hindoo Koosh, such for instance, as the Koonur and Bajore valleys.

On the subject of Minerals, I am not competent to afford any sound information, but I trust that in the prosecution of my experiment, the expence of land carriages, of labour, the general scantiness of streams, and perhaps their general inapplicability, may always be borne in mind.

If mines are ever worked at Taigea, the products will be chiefly limited to the supply of the Cabool markets, for, so far as my information goes, the Cabool river is not used for descent above Balabagh. This may possibly arise from prejudice on the part of the natives, and it may perhaps be considered worth while putting it to the test by means of a survey.

Bajore, I have always understood, to be deficient in streams. Forests of firs and oak doubtless exist on the ranges to the north of the valley, but whether so near to the mine as to be thoroughly applicable, remains to be discovered.

On the subject of minerals, generally, the remark may be made, that those of Afghanistan can only be expected to meet with a market in the country. India is I imagine independent in this respect, and to supply the European market appears to me a problematical assumption.

Wool.—It is to the wool of the country that I conceive especial attention should be paid: the material exists in great abundance, and trading in it will be in perfect unison with the habits of a great part of the Afghan population. A good deal will depend upon the time at which the best shearing takes place; this is stated by Captain Hutton to take place in the summer. If this is generally the case, the wool will be subjected to land-carriage from the higher districts to the lower. Captain Hutton states, that the winter shearings are reckoned inferior from the dirt occasioned by penning; but this scarcely applies to Eastern Afghanistan, throughout all the parts of which known to me, the flocks are in the autumn driven from the high to the low lands.

The great emigrations which thus take place towards Julalabad, will abstract a good deal of the wool, from additional expence of land-

carriage ; the Cabool river being available to Peshawur, or to the Indus. What is first required, is an exact knowledge of its excellence, and the cost, inclusive of every charge, at which it can be delivered first at Bombay, finally in England.

If the properties of the wool be promising,* steps can be taken to improve the native breed by importation of the best foreign stocks. Improvement of wool is stated to depend primarily on attention to the breeds of Sheep, &c. It is also influenced by soil, climate, and food. It has been ascertained that fine clothing wool, the only one, judging from the dry climate, and pastures of Afghanistan, that can be chiefly looked for, may be grown equally fine in most situations, so that the sheep are confined and kept on dry food, a great part of the year. "It may also be grown on the richest pastures, provided these be overstocked to keep the herbage bare." It appears to me, but I beg it to be borne in mind, that I am no authority in such matters, that circumstances intermediate in some degree between dry food and rich pastures, are prevalent naturally throughout Afghanistan. It is also somewhat to the purpose to remark, that the climate of New South Wales is considered extremely favourable from its dryness and mildness, and that great advantage is derived from the absence of briars and underwood. The mildness, though not a feature of the Afghan climate, is obtained by the migrations I have alluded to, and the absence of briars and underwood is complete. The introduction of first rate rams is the main object at first: the offspring of the female appears to be always influenced by the first male with which it has had intercourse. It will be a matter of primary importance, therefore, to commence with best untried ewes and first-rate rams.

"By breeding from a coarse-woolled ewe and a pure fine-woolled ram, the produce of the first cross will have a fleece approaching one-half to the fineness of that of the ram ; and by continuing to cross the progeny with a fine-woolled ram, equal to the first ram in quality, the fleece of the score and cross will approach three-fourths to the fineness of the first, and in a few crosses more will be brought to an equal quality." Breeding in and in must be strictly avoided. But by breeding from a coarse-woolled ram and a fine-woolled ewe, the series will be

* On this subject I have no direct knowledge. For the accompanying remarks, I am indebted to Rees' Cyclopædia.

reversed, and if continued, will be attended by the disappearance of the fine-woolled race.

I know nothing more likely to invite to improvement than the history of wool, nothing that should inculcate more steadily the advantages of interchange of breeds. Sheep's wool appears to be the product of cultivation; no wild animal is known resembling the wool-bearing sheep. The wild sheep of Afghanistan, and indeed all the wild animals of the same family in the country, are covered with short coarse hair of large diameters, under which, and next to the skin, occurs a various proportion of short wool. The effect of cultivation appears to be the falling off of the coarse hair, the place of which is supplied by the increased growth of the wool.

The fine wool equal to the best Merino, now produced exclusively in Australia is entirely owing to the skill and perseverance of a single individual, John MacArthur, Esq. His stock originally consisted of 30 coarse-haired Bengal ewes, but having in 1795 procured one Merino ram and two ewes from the Cape, he commenced crossing, and by constantly selecting the finest-woolled progeny for breeding from, he at length succeeded completely. In 1802 he came to England, and obtained certain advantages as rewards, he returned with three Merino rams and two ewes. In 1807, he possessed 7,000 sheep, and the better sort of this wool he sent to the English markets, was considered equal to the best Merino in every point, but cleanness.

I have to add, that the signs of fine clothing wools are fineness of fibre, softness, length, and soundness and equality of staple, (by which are meant the locks of aggregated fibres.) The colour should be pure white, and as the weight is materially influenced by cleanliness, this last is an object of great importance to the wool buyer.

Among the manifold ways by which Afghanistan may be made to benefit by its intimate connection with Great Britain, the introduction of useful plants, such as those adapted for timber, for food, or for other domestic purposes, is assuredly not the least in the scale. The plants most likely to succeed are perhaps those of Southern Europe. Some of the most important of those of Kunawur, might also be, I think, successfully introduced: with regard to these, I take the liberty of submitting the accompanying list, premising, that it is drawn up on general considerations, not strict practical knowledge.

List of useful and ornamental Arborescent or Shrubby Plants, adapted to the middle regions of Afghanistan.

Botanical Names.	Native Country.	Uses.
Quercus Robur, W.	...	...
" Hex, W.	Britain, ...	Timber, tanning and dyeing.
" Suber, W.	S. France, ...	Timber.
" Asculus, W.	S. France, Spain, ...	Cork-Bark.
" Virens, Ph.	S. Europe, ...	Edible Seeds.
" Cerris, W.	N. America, ...	Excellent Timber.
Castanea Vesca, W.	S. Europe, ...	Timber, very ornamental.
Ostrya Vulgaris, W.	S. Europe, ...	Timber and fruit, Spanish Chesnut.
Carpinus orientalis, W.	Italy, ...	...
Fagus sylvatica, W.	Levant, ...	...
Corylus Avellana, W.	England, &c. ...	...
Liquidambar styraciflua,	Europe, ...	Ornamental, and variously useful.
Platanus occidentalis, W.	N. America, ...	Variously useful, Hazelnuts.
Alnus glutinosa, W.	N. America, ...	Timber and Gum.
" oblongata, W.	Europe, ...	Timber, ornamental.
Betula alba, W.	S. Europe, ...	Timber.
" pendula, North,	Britain, ...	Timber.
" populifolia, W.	Europe, ...	...
" papyracea, W.	N. America, ...	Ornamental.
" Cuta, W.	N. America, ...	Timber.
Salix alba, W. ...	N. America, ...	Timber.
" viminalis, W.	Europe, ...	Excellent Timber.
" stipularis, W.	...	...
" Fortyana, W.	England, ...	...
" rubia, W.	Britain, ...	...
" "	England, ...	...

These species of Willow variously useful, as timber, or more especially for basket-work.

Botanical Names.	Native country.	Uses.
<i>Populus alba</i> , W.	Britain,	Wood for turning.
" <i>tremula</i> , W.	Ditto,	Ditto for ditto.
" <i>nigra</i> , W.	Britain,	Wood for turning.
" <i>dilatata</i> , W.	Italy,	Timber.
<i>Ulmus glabra</i> , W.	Britain,	} Timber.
" <i>Campestris</i> , E.B.	Palestine,	} Timber.
<i>Celtis Australis</i> , W.	S. Europe,	Timber and edible nuts.
<i>Juglans alba</i> , W.	N. America,	Timber and edible nuts.
" <i>nigra</i> , W.	Ditto,	Ditto ditto.
" <i>sulcata</i> , W.	Ditto,	} Ditto Hickory of America.
" <i>glabra</i> , W.	Ditto,	} Ditto and edible nuts.
<i>Salisburia adiantifolia</i> ,	Japan,	Fruit.
<i>Pinus Longifolia</i> , W.	Sub-Himalyas,	Timber, Tar, Rosin.
" <i>Laricio</i> , P.S.	Corsica,	Timber.
" <i>Pinaster</i> , W.	S. Europe,	Ornamental.
" <i>Pinea</i> , W.	S. Europe,	Ditto. edible seeds.
" <i>Canariensis</i> , Buel,	Canaries,	Timber.
" <i>Gerardiana</i> ,	Kunawur,	Ornamental.
<i>Abies picea</i> , W.	Germany,	Ornamental.
" <i>Orientalis</i> , W.	Levant,	Excellent Timber.
<i>Larix communis</i> , Sal,	Germany,	Ornamental.
<i>Cedrus Libanotis</i> , Barr,	Levant,	Ditto, excellent Timber.
" <i>Deodara</i> ,	Himalyas,	Ornamental.
<i>Cupressus tomliosa</i> ,	Ditto.	Ornamental.
<i>Taxus baccata</i> , W.	Europe,	Timber, the Yew tree.

List of useful and ornamental Arborescent or Shrubby Plants, adapted to the middle regions of Afghanistan.

Botanical Names.	Native country.	Uses.
<i>Buxus sempervirens</i> , W.	Europe, Levant, ..	Variouly useful Box.
<i>Suilingia sebifera</i> , W. . .	China, ..	Gives tallow,
<i>Acer Pseudoplatanus</i> ,	Austria, Italy, ..	Timber.
" <i>Opalus</i> , W. . .	Italy, ..	Very ornamental,
" <i>platanoides</i> , W. . .	Europe, ..	Ornamental.
<i>Æsculus Hippocastanea</i> ,	Asia, ..	Variouly useful.
<i>Tilia intermedia</i> , Heque,	Britain, ..	} Linden or Lime trees, variously useful.
" <i>rubia</i> , Dec. . .	Europe, ..	
<i>Ilex Aquifolium</i> , W. . .	Europe, ..	Ornamental, for hedges, &c.
" <i>diphyrena</i> , Wab, ..	Himalyas, ..	Ditto.
<i>Rhamnus infectoria</i> , W.	S. Europe, ..	Ornamental.
" <i>alatus</i> , W. ea.	Ditto, ..	Olive, said not to flourish far from the sea.
<i>Olea Europea</i> , W. . .	S. Europe, ..	The Privet, adapted for hedges.
<i>Ligustrum vulgare</i> , W.	Europe, ..	} Ornamental Lilacs.
<i>Syringa vulgaris</i> , W. . .	Persia, ..	
" <i>persica</i> , W. . .	Ditto, ..	Yields the Manna of commerce.
<i>Omus Europæa</i> , P.S. . .	Italy, ..	Ash, variously useful.
<i>Fraxinus excelsus</i> , W.	Europe, ..	Yields Storax.
<i>Styrax Officinalis</i> , W.	Italy, Levant, ..	Edible Seeds.
<i>Cerantonia Siliqua</i> , W. . .	Levant, ..	Timber.
<i>Robinia Pseudoacacia</i> , W.	N. America, ..	Furze, ornamental.
<i>Ulex Coropæas</i> , W. . .	Britain, ..	Laburnum, ornamental.
<i>Cytisus Laburnum</i> , W.	Switzerland, ..	Ditto, Timber.
" <i>Alpznus</i> , Wen.	Europe, ..	

Herbaceous Plants.

Botanical Names.	Native Country.		Uses.
<i>Anchusa tinctoria</i> , W....	...	S. Europe, ...	... Yields a red dye.
<i>Digitalis purpurea</i> , S.	Europe, ...	... Foxglove, medicinal.
<i>Trifolium repens</i> , W.	Europe, ...	... Most valuable as an artificial grass, (Clover).
<i>Hedysarum Onobryches</i> , W.	Europe, ...	... Saintfoin, an excellent artificial grass, may be tried on the glacis and slopes.
<i>Liquoritia Officinalis</i> , Monel,	S. ditto, ...	... Yields the Liquorice of commerce.
<i>Colchicum autumnalis</i> , W.	Europe, ...	... Medicinal,
<i>Ipomea Jalapa</i> ,	Mexico, ...	... Yields the Jalap, which requires a cool and dry climate.
<i>Humulus Lupulus</i> ,	Europe, ...	... Yields the Hop of commerce.

Several of the European fruits may also be introduced with benefit, such as currants, raspberries, strawberries.

Of vegetables, the artichoke, parsnip, carrot, turnip, potatoes, horse radish, celery, sea kale, asparagus, parsley, good lettuces, endive, are desiderata; some of them exist indigenously, but cultivated kinds are required.

For the more tropical parts of the country, I would recommend the introduction (or extension) of the Sissoo, Series, Jamin, the Mhowa, Toon, Mangoe, and Kikkur.

The list might be extended almost indefinitely. I have taken my authority for most of the plants adapted to the middle regions, by which may be meant all between 3,000 and 7,500 feet, from Loudon's *Encyclopædia*, which book is also my authority for the properties of the species. With regard to the North American plants, detailed information is required, the habitats given by Mr. Loudon embracing half of the new world.

Among these proposed introductions, the hop will be found. In a conversation with Dr. Falconer, it was suggested to me, that the Afghan climate, from its dry summer, would probably be well adapted to the cultivation of this plant. I in return suggested that the fine tracts between Mookloor and Ghuzni, the valleys about Cabul and Kohistan generally, would seem to be the most promising sites. I would not now omit Candahar. I think that with regard to climate, Afghanistan appears to present most, if not all, the circumstances under which the hop reaches perfection in England; and I also think, that the experiment should be tried. Mr. Loudon says, in his *Encyclopædia of plants*, that the expences of a hop plantation are very great. But I do not think that considerations of this kind, except where the expence is unreasonable, are to be taken into so much weight when connected with useful proposals recommended to a powerful Government. Even putting the question into the shape of pounds, shillings, and pence, great direct returns might be expected in the increased duration of life among the European soldiery in India, to say nothing of the enormous indirect advantage the army would derive from that increase of sobriety, likely to attend the substitution of good beer, for noxious ardent spirits. Excellent practical information regarding the hop is to be found in the *Penny Cyclopædia*, vol. xii. and I would

suggest, that the article alluded to, should dictate the line of operations, should the experiment be sanctioned by Government.

The same manure which in Flanders frequently ensures very large returns, will not be difficult to procure, and may with much greater cleanliness be used for the improvement of this plant, than in the baking of bread, or heating of baths.

Cochineal. I must not pass over a product of the animal kingdom, which though not indigenous to Afghanistan, is to Central Asia. I allude to the Cochineal, to which attention was first drawn by Sir A. Burnes, in his adventurous journey to Bokhara. This same distinguished officer obligingly furnished me with samples of the Asiatic product and that of America, derived from Russian commerce. He also sent me specimens of a leguminous shrub on which the insect is said to feed, and which is indigenous to Afghanistan. I could not detect any difference between the two articles, either in their appearance or the colour of their infusion. The subject is worth enquiring into; for my own part, I could not but apprehend that some mistake has occurred, and that the Asiatic insect, of whatever nature its colouring matter may be, will be found to differ in more material points from the American one.

Observations for Latitude from Mer. Altitudes of the Sun or Stars.

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
March 2.	Bagh,	Sirius,	89°	25	29.810	65	
" "	Ditto,	ε Canis Majoris,	64.30.10	25	"	"	h. m.
" "	Ditto,	⊙	107.23.40	40	29.848	10.5°	Assumed E. Long. 4-32.
" 3	Ditto,	Sirius,	89.	"	29.770	70	
" "	Ditto,	ε Canis Majoris,	64.29.40	"	"	"	Mean Latitude 29°-1'-20"
" 4	Ditto,	β Ursæ Minoris,	88.29.00	"	29.800	55	
" "	Mysoor,	Sirius,	88.41.20	20	29.700	70	
" "	Ditto,	ε Canis Majoris,	64.11.15	"	"	"	h. m.
" "	Ditto,	⊙	108.35.50	"	29.807	10.0	Assumed Long. E. 4-32.
" 5	Ditto,	Sirius,	88.41.15	"	29.685	70	
" "	Ditto,	ε Canis Majoris,	64.11.10	"	"	"	
" "	Ditto,	β Ursæ Minoris,	88.48.50	"	29.700	65	
" 6	Ditto,	Sirius,	88.18. 5	29.2	29.650	70	} Mean Lat. 29°-22'-15"/8.
" "	Nowshera,	ε Canis Majoris,	63.47.40	"	"	"	
" "	Ditto,	⊙	108.59.50	"	"	"	
" 7	Ditto,	β Ursæ Minoris,	89.10.50	83	"	60	h. m.
" "	Ditto,	⊙	109.33.40	"	29.438	90	Assumed Long. E. 4-30.
" 8	Dadur,	⊙	110.20.50	"	29.372	"	
" "	Ditto,	β Ursæ Minoris,	89.23.20	25	29.300	95	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
March 11.	Dadur,	Antares, ☉	68.58.10	25	29.300	95	
" "	Drubhee Bolan Pass,	..	112.40.	"	29.406	80	
" 12	Drubhee Bolan Pass,	β Ursæ Minoris,	89.23.15	"	"	60	
" "	8 Miles into Bolan	☉	113.28.25	20	29.210	85	
" "	Pass,	..					
" 13	Ditto,	Antares,	68.57.55	"	29.200	56	
" "	Ditto,	Saturn,	80.48.35	"	"	"	
" "	Gurmab,	☉	114. 1.45	"	29.003	85	
" 14	Ditto,	☉	114.49.20	"	28.995	"	Cloudy.
" 15	Ditto,	β Ursæ Minoris,	89.36.40	"	29.000	60	
" "	Ditto,	Antares,	68.44.15	"	"	"	
" "	Ditto,	Saturn,	80.34.40	20	"	"	
" 16	Bebee Nanee,	Antares,	68.31.30	"	28.350	51	
" "	Ditto,	Saturn,	80.22.45	"	"	"	
" "	Abigoom,	☉	115.56.50	"	27.603	74	
" "	Ditto,	α Hydra,	104.29.50	"	27.518	63	
" 20	Munzil Dust-i-be,	Hydra,	104.16.45	20.5	24.500	34	
" "	Dowlut,	☉	119.41.20	"	"	62	
" "	Ditto,	Hydra,	104.16.35	40.8	"	46	
" 24	Siriah,	Ditto,	103.54.45	"	24.600	50	
" 25	Quetta,	Ditto,	103.41.45	"	24.700	48	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
March 29.	Quetta,	Hydræ,	103.41.20	40.8	24.700	42	h. m.
" 30	Ditto,	☉	126. 9.25	"	0.720	75	Assumed Longitude 4-15.
" "	Ditto,	α Hydræ,	103.41.30	"	0.700	46	
" 30	Ditto,	Dubhe,	115.14.00	"	"	42	
" 31	Ditto,	☉	127.18.56	41	"	85	Doubtful observation.
April 2d.	Ditto,	α Hydræ,	103.14.30	40.8	0.730	55	Mean Latitude.
" "	Ditto,	☉	128.28.30	"	"	85	Quetta, 30° 12' 52" 8.
" "	Ditto,	Dubhe,	115.13.45	"	"	57	
" 6	Ditto,	Ditto,	115.14.50	"	"	46	
" 8	Hydrozye,	α Hydræ,	103. 9.	"	25.100	61	Hurried observation.
" "	Ditto,	Dubhe,	115.46.45	43	"	58	
" 9	Hykulzye,	Hydræ,	102.52.20	"	25.200	55	
" "	Ditto,	Dubhe,	116. 3.10	"	"	50	
" 10	Berumbye,	α Hydræ,	102.40.55	"	24.700	65	
" 11	Kojhuck Pass,	α Hydræ,	102.25.35	"	23.600	60	
" "	Ditto,	α Hydræ,	116.29.30	"	"	55	
" 13	Choky,	Ditto,	116.31.20	31	24.720	55	
" 14	Ditto,	Ditto,	116.31.50	"	"	66	
" 20	Dundi Goollai,	α Hydræ,	102. 9.45	"	26.200	75	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
April 21	Kila Putoola,	...	116.27.40	31	26.200	75	Doubtful.
" 24	Dai Haj,	Dubhe,	117.37.33	40	26.500	80	
" 28	Candahar,	Dubhe,	118. 0.50	1.27	26.550	70	
" "	Ditto,	β Corvi,	71.52.55	"	" "	"	
" 30	Ditto,	Dubhe,	117.58.40	"	26.600	75	Hurried observation.
" "	Ditto,	β Corvi,	71.52.00	"	" "	70	
" "	Ditto,	Jupiter,	111.17.00	"	" "	"	
" "	Ditto,	Spica,	96.13.25	"	" "	"	
" "	Ditto,	Dubhe,	118. 0.10	1.17	26.660	75	
May 2nd.	Ditto,	β Corvi,	71.22.25	"	0.650	"	
" "	Ditto,	Jupiter,	111.25.10	"	" "	"	
" "	Ditto,	Spica,	96.14.20	1.175	26.650	72	
" 3	Ditto,	β Corvi,	71.53.30	"	" "	78	
" "	Ditto,	Jupiter,	111.30.00	"	" "	"	
" "	Ditto,	Spica,	96.14.40	"	" "	75	
" 5	Ditto,	β Corvi,	71.52.40	"	" "	"	
" "	Ditto,	Jupiter,	111.37.30	"	" "	72	
" "	Ditto,	Spica,	96.14.10	"	" "	70	
" 15	Ditto,	... ..	96.15.00	12.8	" "	75	
June 3	Ditto,	β Ursæ Minoris,	93.37.25	1.31.6	" "	80	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839. June 3	Candahar,	... β Libræ,	99.19.55	1.9	26.650	80	
" 10	Ditto,	... α Libræ,	86. 8.45	"	" "	70	Hurried observation.
" "	Ditto,	... β Ursæ Minoris,	93.37.45	"	" "	70	
" 11	Ditto,	... α Libræ,	86. 8.30	1.19.2	" "	70	
" "	Ditto,	... β Ursæ Minoris,	93.37.30	"	" "	"	
" "	Ditto,	... β Libræ,	99.19.25	"	" "	"	
" 12	Ditto,	... β Libræ,	86. 9.00	"	" "	64	
" "	Ditto,	... α Ursæ Minoris,	93.37.10	"	" "	"	
" "	Ditto,	... β Libræ,	99.18.50	"	" "	"	Mean Latitude.
" 13	Ditto,	... α Libræ,	86. 9.00	"	" "	70	Candahar, 31°35'19".
" "	Ditto,	... β Ursæ Minoris,	93.36.00	"	" "	"	
" "	Ditto,	... β Libræ,	99.18.10	"	" "	"	
" 15	Ditto,	... β Ursæ Minoris,	93.37.40	"	" "	62	
" "	Ditto,	... β Libræ,	99.18.40	"	" "	62	
" 16	Ditto,	... α Libræ	86. 8.50	1.25	" "	"	
" 17	Ditto,	... β Ursæ Minoris,	93.37.00	"	" "	70	
" "	Ditto,	... β Libræ,	99.18.50	"	" "	"	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
June 17	Candahar,	... α Libræ,	86. 8.25	1.25	26.650	70	
" 18	Ditto,	... β Ursæ Minoris,	93.37.30	"	"	"	
" "	Ditto,	... β Libræ,	99.18.25	"	"	"	
" "	Ditto,	... β Libræ,	86. 8.00	"	"	"	
" 19	Ditto,	... β Ursæ Minoris,	93.36.30	"	"	80	Hot Westerly winds.
" "	Ditto,	... α Libræ,	99.18.45	"	"	"	
" "	Ditto,	... β Libræ,	86. 7.50	"	"	"	
" "	Ditto,	... β Scorpïi,	78. 9.40	"	"	"	
" "	Ditto,	... Antares,	64.45.20	"	"	"	
" 20	Ditto,	... β Scorpïi,	78. 9.30	"	"	"	
" 22	Ditto,	... ..	78. 9.30	"	"	"	
" "	Ditto,	... β Draconis,	119.28.20	"	"	"	
" "	Ditto,	... β Cephei,	103.31.45	"	"	72	
" "	Ditto,	... Draconis,	119.28.50	"	"	78	
" 23	Ditto,	... β Cephei,	103.32.45	"	"	"	
" 24	Ditto,	... α Cephei,	119.25.20	"	"	"	
" "	Ditto,	... β Libræ,	99.10.25	1.5	"	70	
" 28	Kolah-i-Azeem,	... β Ursæ Minoris,	93.44.40	"	26.240	85	Hurried observation.
" "		"	"	"	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitudes.	Error.	Barometer.	Therm.	REMARKS.
1839.							
June 29	Turnukur. Khail-i-Akhood.	... } β Ursæ Minoris,	93.53.00	1.5	25.858	80	
" "	" "	... } β Libræ,	99. 2.35	"	" "	"	
" 30	Shair-i-Suffa,	... } β Ursæ Minoris,	94. 2.30	"	25.668	"	
" "	" "	... } β Libræ,	98.52.30	"	" "	"	
July 1st.	Near Tirandaz,	... } β Ursæ Minoris,	94. 9.40	"	25.500	80	
" "	" "	... } β Libræ,	98.45.20	"	" "	"	
" 2	Toot,	... } β Ursæ Minoris,	94.18.40	"	25.300 assd.	80	
" "	" "	... } β Libræ,	28.36.40	"	" "	"	
" 4	Kholah-i-Giljee,	... } β Scorpionis,	77. 5.45	"	24.700	75	Indifferent.
" "	" "	... } β Draconis,	120.33.30	1.0	" "	"	Mean Latitude.
" 5	" "	... } β Libræ,	98.14.00	"	" "	80	
" "	β	... } β Scorpil,	77. 5.10	"	" "	78	Kelat-i-Ghilzie.
" "	" "	... } β Draconis,	120.32.10	"	" "	76	32° 7' 24."
" "	" "	... } δ Ophiuchi,	109.14.50	"	" "	"	
" 6	Sir-i-Asp,	... } β Scorpil,	76.55.50	"	24.500	70	
" "	" "	... } δ Ophiuchi,	109. 5.35	"	" "	"	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Latitude.	Error.	Barometer.	Therm.	REMARKS.
1829.							
July 6	Sir-i-Asp,	β Draconis,	120.42.40	1.0	24.500	70	
" 9	Shuftul,	"	121. 9.20	"	24.050	75	
" "	"	δ Ophiuchi,	108.40.00	"	"	"	
" 11	Chushni Sair,	β Scorp.,	76.17.10	"	23.950	75	Cloudy.
" "	"	Antares,	62.52.20	"	"	"	bright.
" "	"	δ Ophiuchi,	108.27.20	"	"	"	rather cloudy.
" 12	Ghojan,	β Draconis,	121.46.00	53.7	23.600	73	very windy.
" "	"	δ Ophiuchi,	108. 1.35	"	"	"	"
" 13	Mookloor,	"	107.47.50	"	23.570	70	Hurried.
" 14	"	β Draconis,	122.00.00	"	"	"	Mean Latitude.
" "	"	β Scorp.,	75.37.30	"	"	73	Mookloor,
" "	"	δ Ophiuchi,	107.46.50	"	"	"	30° 51' 27."
" 15	"	β Draconis,	121.59.50	"	"	"	"
" 16	Oba,	δ Ophiuchi,	107.29.00	"	23.400	70	"
" "	"	β Draconis,	122.19.45	"	"	"	"
" 17	Jumrat,	β Scorp.,	75. 4.00	1.	23.300	75	"
" "	"	Saturn,	75.27.35	"	"	"	"
" 18	Near Karabagh,	δ Ophiuchi,	107. 3.00	"	23.435	71	Cloudy and hazy.

Observations for Latitude from Mer. Altitude of the Sun or Stars, — (continued.)

Date.	Station.	Heavenly body.	Observed Latitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
July 18	Near Karabagh, ..	β Draconis,	122.45.10	1.9	23.435	71	
" 20	Nanee Mills,	β Scorpii,	74.31.00	"	23.336	76	
" "	" "	δ Ophiuchi,	106.41.30	"	" "	"	
" "	" "	β Draconis,	123. 5.40	"	" "	"	
" 25	Ghuzni,	ξ Cephei,	93.43.20	1.18	23.000	63	
" 26	" "	β Draconis,	123.25.45	1.42	" "	75	
" "	" "	Saturn,	74.37.00	"	" "	"	Mean Latitude Ghuzni,
" 27	" "	α Cephei,	123.23.10	"	" "	66	33° 34' 27"
" "	" "	β Cephei,	107.29.20	"	" "	"	
" "	" "	Saturn,	74.37.00	"	" "	78	
Aug. 1st.	Hyder Khail,	Fomathaut,	51.12.35	1.7	23.160	60	Observations thus far made
" "	" "	β Cephei,	94.32.15	"	" "	"	with a Gilbert's sextant,
" 2	Shaikabad,	δ Aquilæ,	117.27.40	"	23.360	73	6 inches radius, of his
" "	" "	α Aquilæ,	128.45.10	"	" "	"	usual workmanship.
" "	" "	α Capricorni,	85.49.25	"	" "	"	
" "	" "	δ Aquilæ,	116.37.20	32	24.200	75	
" 11	Cabul,	α Aquilæ,	127.54.30	"	" "	"	Observations from this made with a well furnished 6 ins. radius sextant of Troughton and Si- mons,
" 11	Baber's Tomb,	α Aquilæ,	125.12.40	"	" "	70	
" 13	" "	α Cephei,		"	" "		

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Aug. 13	Baber's Tomb,	.. β Aquarii,	98.26.40	32	24.200	70	} Hurried Observations. Both instruments were divided to 10"
" " β Cephei,	109.18.45	"	"	"	
" " ϵ Pegasi,	129.16.35	"	"	"	
" " α Aquarii,	108.48.55	"	"	"	
" 15 α Cephei,	125.12.40	27.7	"	65	Gilbert's Sextant.
" " β Aquarii,	98.28.10	"	"	"	
" " β Cephei,	109.21.25	1.15	"	"	
" " ϵ Pegasi,	129.16.55	27.7	"	"	
" " α Aquarii,	108.49.00	"	"	"	
" " α Cephei,	125.13.00	"	"	"	
" " β Cephei,	109.19.10	"	"	"	
" " ϵ Pegasi,	129.17.15	"	"	"	
" " α Aquarii,	108.49.00	"	"	"	
" "	108.49.10	18	"	"	
" 8 α Cephei,	125.12.30	"	"	"	
" " δ Pegasi,	130.59.40	"	"	"	
" " Fomathaut,	50. 7.00	"	"	63	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barome- ter.	Therm.	REMARKS.
1839.							
Aug. 19	Baber's Tomb,	.. δ Aquilæ,	116.36.20	43.3	24.200	70	
"	"	.. α Aquilæ,	127.54.20	"	"	75	
" 20	"	.. β Ceti,	73.17.55	"	"	73	
"	"	.. β Cephei,	109.19.15	18	"	65	
"	"	.. ϵ Pegasi,	129.17.20	"	"	"	
"	"	.. Polaris,	72. 9.10	"	"	58	
"	"	.. Ceti,	93. 0.10	"	"	58	
" 21	"	.. α Aquilæ,	127.54.15	"	"	70	
"	"	.. δ Aquilæ,	116.36.30	"	"	"	
" 28	Yourtt,	.. α Aquilæ,	187.58.40	27	20.8.30	48	
"	"	.. \odot	129.45.30	"	"	70	Long. Assd. 4h. 33m. 20s. E.
" 29	"	.. δ Aquilæ,	116.41. 5	"	20.8.26	48	
"	"	.. α Aquilæ,	127.58.40	"	"	"	
"	Siah Sung,	.. δ Aquilæ,	116.27.30	"	20. 9	44	
"	"	.. α Aquilæ,	127.45.35	"	"	"	
" 31	Kaloo,	.. δ Aquilæ,	116.18.30	"	20. 6	44	
"	"	.. α Aquilæ,	127.36.10	"	"	"	

Observations of Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839. Sept. 1	Sooktah,	.. δ Aquilæ,	116.12.20	30	21.410	50	
" "	" "	.. α Aquilæ,	127.30.30	30	" "	"	
" 2	Topchee,	.. δ Aquilæ,	116. 4.15	40	22 000	56	
" "	" "	.. α Aquilæ,	127.21.40	"	" "	"	
" 3	Bamean,	.. δ Aquilæ,	115.57.55	33	22.830	50	
" "	" "	.. α Cephei,	125.51.20	"	" "	46	
" "	" "	.. β Aquarii,	97.49.40	"	" "	"	
" "	" "	.. ϵ Pegasi,	128.38.50	"	" "	"	
" "	" "	.. α Aquarii,	108.11.10	"	" "	"	
" 4	" "	.. \odot	124.41.40	"	22.460	100	Long. Asd. 4h. 33m. E.
" "	" "	.. δ Aquilæ,	115.57.50	"	" "	50	
" "	" "	.. α Aquilæ,	127.16.00	"	" "	"	
" "	" "	.. α Cephei,	125.51.00	"	" "	46	Mean Lat.
" "	" "	.. β Aquarii,	97.50.00	"	" "	"	Bamean $39^{\circ} 49' 11''$.
" "	" "	.. ϵ Pegasi,	128.39.30	"	" "	"	
" "	" "	.. α Aquarii,	108.11.30	"	" "	"	
" "	" "	.. \odot	123.57.30	"	" "	100	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Sept. 6	Trohawk,	.. δ Aquilæ,	115.58.10	33	22. 7	58	
" "	" "	" α Aquilæ,	127.15.40	"	" "	"	
" 7	Erak,	.. ☉	122.28.40	31	22.130	96	
" 9	Kurzac,	.. δ Aquilæ,	116.19.15	"	20. 57	42	
" "	" "	" α Aquilæ,	127.36.50	"	" "	"	Cloudy.
" 10	Girdun Dewar,	.. ☉	120.51.00	32	21. 2	90	
" 12	Ciri Chushon,	.. δ Aquilæ,	116.44.40	"	22. 2	54	
" "	" "	" α Aquilæ,	128. 2.35	"	" "	"	
" 13	Jubraz,	.. ☉	118.38.10	"	22.760	98	
" 14	Kote-i-Ashruf,	.. ☉	117.55.20	"	23.109	"	
" 15	Urghundi,	.. ☉	117. 6.20	"	23. 26	100	
" "	" "	.. δ Aquilæ,	116.40.25	"	" "	65	
" "	" "	" α Aquilæ,	127.58.20	"	" "	"	
" 16	Topchee Bashee,	.. δ Aquilæ,	116.36.40	"	23.	"	
" "	" "	" α Aquilæ,	127.54.35	"	" "	"	
" 20	Cabul,	.. α Cephei,	125.13.10	27	24. 14	65	
" "	E. side in Camp,	.. α Aquarii,	108.49.40	"	" "	"	
" 21	" "	.. ☉	112.23.20	"	" "	100	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed, Latitude.	Error.	Barome- ter.	Therm.	REMARKS.
1839.							
Sept. 21	E. side in Camp, ..	α Aquilæ,	127.54.10	27	24. 14	65	
"	"	α Cephei,	125.13. 5	"	"	"	
"	"	β Cephei,	109.19.35	"	"	60	
"	"	ϵ Pegasi,	129.17.25	"	"	"	
" 22	"		111.35.50	30	"	98	
" 23	Cabul,		110.49.20	"	"	"	
" 24	"		110. 2.45	"	"	"	
" 25	"		109.16.00	"	24. 24	"	
" 28	"		106.54.55	"	24. 14	"	
" 30	"		105.21.45	18.7	24.300	"	
Oct. 1.	"		104.34.40	"	"	105	
" 2	"		103.48.15	"	24.316	"	
" 3	"		103. 2.00	"	24. 35	"	
" 5	"		94.15.00	"	"	40	
"	"	Rigel,	108.24.60	"	"	"	
"	"	ϵ Orionis,	125.45.35	"	"	"	
"	"	Betelgeux,	101.29.00	"	"	"	
" 6	"		100.42.50	"	"	110	
" 7	Boothkah,		100. 9.25	"	24. 3	105	
" 8	Khoosd Cabul,		99.22.00	"	23.293	90	
"	Taizeen,			13	24. 05	"	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Latitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Oct. 8.	Taizeen,	α Cephei,	125. 1.30	13	24.05	45	
" "	"	β Aquarii,	98.40.25	"	"	"	
" "	"	ϵ Pegasi,	129.29.40	"	"	"	
" "	"	α Aquarii,	109. 1.20	"	"	"	
" "	"	\odot	98.36.40	"	"	90	
" 9	"	α Cephei,	125.00.00	"	"	45	
" "	"	β Aquarii,	98.40.10	"	"	"	
" "	"	ϵ Pegasi,	129.29.40	"	"	46	
" "	"	α Aquarii,	109. 1.15	"	"	"	
" "	"	\odot	97.37.45	27	25. 1	100	
" 10	Barikab,	α Cephei,	125.13.00	"	"	58	
" "	"	β Aquarii,	98.27.20	"	"	"	
" "	"	ϵ Pegasi,	129.16.45	"	"	"	
" "	"	α Aquarii,	108.48.25	"	"	"	
" "	"	\odot	97. 1.20	20	25.04	90	
" 11	Jugdulluck,	ϵ Pegasi,	129.25.50	"	"	58	Mean Lat.
" "	"	\odot	96.16.00	16	25.100	90	Jugdulluck, 34° 26' 24".8.
" 12	"	\odot					

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Oct. 12	Jugdulluck,	α Cephei,	125. 4.10	16	25.100	60	
" "	" "	β Cephei,	109.10.40	"	" "	"	
" "	" "	β Pegasi,	129.25.40	"	" "	"	
" 13	Soorkhab,	β Aquarii,	98.48.20	"	25. 9	60	
" "	" "	α Cephei,	124.53.10	"	" "	"	
" "	" "	ϵ Pegasi,	129.37.00	"	" "	"	
" "	" "	α Aquarii,	109. 8.50	"	" "	"	
" 14	Gundamuck,	\odot	95. 3.45	22	25. 7	100	Mean Lat.
" "	" "	α Cephei,	124.46.45	"	" "	56	Gundamuck $34^{\circ} 17' 36''$ 8.
" "	" "	β Cephei,	108.53.20	"	" "	"	
" "	" "	ϵ Pegasi,	129.43.00	"	" "	"	
" "	" "	α Aquarii,	109.15.25	"	" "	"	
" 16	Futtehabad,	\odot	93.27.00	18	27. 05	106	Long. Assd. 4h. 41m. E.
" "	" "	α Cephei,	124.53.30	"	" "	52	
" "	" "	β Cephei,	109. 0.30	"	" "	"	
" "	" "	ϵ Pegasi,	129.36.00	"	" "	"	
" "	" "	α Aquarii,	109. 7.50	"	" "	"	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Oct. 17	Futtehabad,	☉	92.42.50	15	27.106	96	
" 18	" "	α Cephei,	124.53.40	"	"	58	
" "	" "	β Cephei,	109. 0.15	"	"	"	
" "	" "	ε Pegasi,	129.36.00	"	"	56	
" "	" "	α Aquarii,	109. 8.00	"	"	"	
" 19	" "	☉	91.15. 5	"	27. 17	85	
" 20	Sultanpore,	☉	90.24.40	54.2	27. 96	98	
" "	" "	α Cephei,	124.59.25	44+	"	58	
" "	" "	β Cephei,	109. 6.20	"	"	"	
" "	" "	ε Pegasi,	129.28.20	"	"	"	
" 21	Julalabad,	☉	89.39.15	28.5+	28. 2	104	
" "	" "	α Cephei,	125. 1.15	"	"	56	
" "	" "	β Cephei,	109. 8.00	"	"	"	
" "	" "	ε Pegasi,	129.26.20	"	"	"	
" 22	" "	Rigel,	94.23.50	"	"	48	
" "	" "	Betelgeux,	125.54.15	"	"	"	
" "	" "	Sirius,	78.11.40	"	"	44	
" "	" "	☉	88.55.50	47.5+	28. 15	106	
" "	" "	α Aquarii,	108.57.50	"	"	60	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Oct. 22.	Jelalabad,	..	50.16.00	47.5+	28.15	60	Mean Lat. Jelalabad, 34° 25' 5"
" 23	"	Fomalhaut, ☉	88.13.55	45+	28.211	106	
" "	"	α Aquarii,	108.58.35	"	"	56	
" "	"	ξ Pegasi,	131. 9.30	"	"	"	
" "	"	Fomalhaut, ☉	50.16.00	"	"	"	
" 24	"	..	87.31.00	54+	"	110	
" 25	"	β Cephei, ☉	86.49.40	50+	28. 2	107	
" "	"	..	109. 7.20	"	"	60	
" "	"	α Aquarii,	108.57.30	"	"	"	
" 26	"	Rigel,	94.23.40	"	"	45	
" "	"	ε Orionis,	108.33.00	"	"	"	
" "	"	Beigelux,	125.54.15	"	"	"	
" "	"	Sirius,	78.11.20	"	"	"	
" "	"	Procyon,	122.25.30	"	"	"	
" "	"	..	86. 8.00	51+	"	120	
" 27	Ali Baghan,	☉	85.33.10	48.5+	"	110	
" "	"	α Cephei,	124.55.20	"	"	68	
" "	"	β Aquarii,	98.42.50	"	"	78	
" "	"	ε Pegasi,	129.32.10	"	"	"	
" "	"	α Aquarii,	109. 3.40	"	"	"	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitudes.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Oct. 28.	Barikab, ..	☉	84.58.40	30. +	28. 36	105	
" 29	North Chardeh, } Bussoollah, ..	☉	84.26.30	50. +	28. 63	105	
" "	" ..	ε Pegasi,	129.46.30	"	" "	62	
" "	" ..	α Aquarii,	109.18.10	"	" "	"	
" 30	Lalpore, ..	☉	83.50.30	83. +	28. 75	103	
" "	" ..	α Aquarii,	109.21.10	"	" "	65	Mean Lat.
" "	" ..	ξ Pegasi,	131.32.30	"	" "	"	Lalpore, 34° 13' 25"
" "	" ..	Fomalhaut,	50.39.00	"	" "	"	
" 31	" ..	☉	83.10.10	45. +	28. 73	109	
" "	" ..	α Aquarii,	109.22.00	"	" "	65	
" "	" ..	ξ Pegasi,	131.32.40	"	" "	"	
" "	" ..	Fomalhaut,	50.39.50	"	" "	"	
Nov. 1.	Lundye Khanal, ..	☉	82.45.10	42. +	27. 67	93	
" "	" ..	ξ Pegasi,	130. 3.10	"	" "	60	
" "	" ..	α Aquarii,	109.35.20	"	" "	62	
" "	" ..	☉	82. 6.25	40. +	" "	90	
" 2	" ..	"	109.35.25	"	" "	62	
" "	" ..	α Aquarii,	"	"	" "	"	
" 4	Ali Musjeed, ..	☉	81. 2.20	"	27. 70	90	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1839.							
Nov. 5	Mouth of Khyber.	ξ Pegasi,	132. 2.00	40. +	28. 4	64	
" "	" "	Fomalhaut,	51. 9. 5	"	"	"	
" 7	Peshawur,	⊙	79.14.00	"	29. 1	90	
" 8	" "	ξ Pegasi,	131.59.10	35. +	"	60	
" "	" "	Fomalhaut,	51. 6.15	"	"	"	
" "	" "	Sirius,	79. 1.40	"	"	50	Mean Lat.
" "	" "	Procyon,	123.15.30	"	"	"	Peshawur, 34° 00' 5"
" 9	" "	⊙	78. 3.50	"	"	90	
" 11	" "	⊙	76.55.25	43. +	"	"	
" "	" "	ξ Pegasi,	131.59.25	"	"	59	
" "	" "	Fomalhaut,	56. 6.20	"	"	"	
" 12	" "	⊙	76.22.25	50. +	"	90	
" 13	" "	⊙	75.49.25	47. +	"	98	
" 14	" "	⊙	75.17.30	50. +	"	10	
" 15	" "	⊙	74.45.50	"	"	"	
" 16	" "	⊙	74.15.30	48.8+	"	98	
1840.	Bussoat,	Rigel,	94.16.30	41.6+	28. 5	33	
Jan. 11	Near Julalabad,	ε Orionis,	108.25.50	"	"	"	
" "	" "	Belelgeux,	125.46.50	"	"	"	

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barome- ter.	Therm.	REMARKS.
1840.							
Jany. 12	Shaiwa, ..	Rigel, ..	94. 5.20	41.6+	28. 22	40	
" 13	" ..	Beelgeux, ..	125.36.00	"	"	"	
" 17	Pushut, ..	Rigel, ..	67. 6.00	"	"	73	
" 17	" ..	Rigel, ..	93.47.50	"	27. 62	38	
" 17	Camp, ..	Orionis, ..	107.57.10	"	"	"	
" 17	" ..	ε Orionis, ..	125.18.25	"	"	"	
" 25	" ..	Beelgeux, ..	82.38.10	"	"	37	
" 25	Rushut Fort, ..	ζ Eridani, ..	93.46.40	"	"	"	
" 25	" ..	Rigel, ..	107.56.10	"	"	42°	
" 25	" ..	Orionis, ..	125.17.10	"	"	"	
" 29	" ..	Beelgeux, ..	73.44.40	45. +	"	75	h. m. s. Long. Assd. 4. 43.20. E.
" 30	" ..	Rigel, ..	93.46.50	"	"	42	
" 30	" ..	Orionis, ..	107.56.15	"	"	"	
" 30	" ..	ε Orionis, ..	125.17.30	"	"	"	
" 30	" ..	Beelgeux, ..	82.38.00	"	"	"	
" 30	" ..	ζ Eridani, ..	75.56.40	37. +	"	71	
Feb. 1.	" ..	Orionis, ..	79.31.45	50. +	"	72	
" 2	" ..	ε Orionis, ..	77.17.20	53. +	27. 45	63	On roof of house only
" 8	" ..	Sirius, ..	121.31.30	42. +	"	60	tremulous.
March 2	Chugar Serai, ..	Procyon, ..	107.34.00	"	27. 25	"	Good
" 4	Otipore, ..	ε Orionis, ..		"			

Observations for Latitude from Mer. Altitudes of the Sun or Stars,—(continued.)

Date.	Station.	Heavenly body.	Observed Altitude.	Error.	Barometer.	Therm.	REMARKS.
1840.							
March 4	Olipore,	Belegeux,	124.54.50	53+	27.25	60	Mean Lat.
"	"	Sirius,	77.11.10	"	"	"	Olipore.
"	"	Procyon,	121.26.10	"	"	"	34° 54' 38."
" 7	"	"	121.26.10	"	"	50	
" 9	"	Sirius,	77.11.30	35+	"	"	Cloudy.
"	"	"	100.48.20	"	"	85	Assd. Long. 4h. 43m. E.
" 14	"	"	104.44.10	31+	"	100	
"	"	Sirius,	77.11.40	"	"	58	
"	"	Procyon,	121.26.00	"	"	"	
"	"	Hydræ,	94.14.30	"	"	"	
"	"	^a	105.31.30	42.5+	"	97	Cloudy.
" 15	"	"	77.17.10	"	"	58	Mean Lat.
" 17	Chugar Serai,	Sirius,	94.20.40	"	"	63	Chugar Serai.
"	"	Hydræ,	133.44.50	"	"	61	34° 51' 43" 7.
"	"	Regulus,	111.25.10	56+	"	98	
" 22	Pushut Fort,	"	112.13.10	"	27.62	90	
" 23	"	"	115.21.15	29+	"	80	
" 27	"	"	122. 0. 0	"	"	55	Mean Lat.
" 28	Koonur,	Procyon,	94.49.10	"	27.800	52	Koonur.
"	"	Hydræ,	136.14.00	"	"	"	34° 37' 37"
"	"	Regulus,	117. 6.20	"	"	88	
" 29	"	"		"	"	"	

Observations for Azimuth.

Date.	Station.	Time.	Observed Altitude	Bearing.
1840.				
April 3	Pushut Fort,	10. 1.20 A. M.	50.47.43	☉ Altitude L. L. Bearing Centre.
" 4	"	10. 6.00 "	51.30.26	
" 4	"	7.17.00 "	20.28.24	
" "	"	7.19.15 "	20.58.54	
" "	"	8.15.00 "	32. 9. 4	☉ Altitude L. L. Bearing Centre.
" "	"	8.21.00 "	33.19.15	
" "	"	8.26.00 "	34.18.14	
" "	"	8.32.10 "	35.33.28	
" "	"	8.37.10 "	36.30.25	Sirius setting.
" "	"	7.45.00 P. M.	29.57.53	
" "	"	7.50.00 "	29.20.15	
" "	"	7.54.30 "	21.32.35	
" "	"	7.59.30 "	22.33.30	Bootes rising.
" "	"	8. 3.30 "	16.15.11	
" "	"	8. 8.40 "	17. 9. 4	Spica rising.
" "	"	8.13.20 "	16.48.43	
" "	"	8.21.30 "	15.17.12	Rigel setting.
" "	"	8.21.30 "	18.38.34	
" 5	"	7. 5.10 A. M.	19.37.38	☉ Altitude L. L. Bearing Centre.
" "	"	7.10.10 "	31.37.34	
" "	"	8. 9.40 "	32.28.23	
" "	"	8.14.40 "	32.28.23	

Observations for Azimuth,—(continued.)

Date.	Station.	Time.	Observed Altitude.	Bearing.
1840.				
April 14	Olipore,	6.16.40 A. M.	12.42.39	<div> <div>84° 30' 30" 29'</div> <div>85° 35' 5' 4'</div> <div>85° 21' 0' 0'</div> <div>86° 10' 0' 9'</div> <div>87° 24' 5' 3'</div> </div> <div>☉ Altitude L. L. Bearing Centre.</div>
"	"	6.20.00 "	13.25.24	
"	"	6.23.35 "	14. 2. 5	
"	"	6.27. 5 "	14.54.51	
"	"	6.31.00 "	15.14.38	
"	"	9.45.30 P. M.	18.30.27	<div> <div>261° 53' 4' 3'</div> <div>263° 36' 7' 6'</div> <div>263° 49' 9' 50'</div> </div> <div>Procyon setting.</div>
"	"	9.51.45 "	17.18.14	
"	"	9.57.20 "	16.13. 9	
"	"	10. 1.45 "	21.10. 6	<div> <div>53° 43' 2' 3'</div> <div>56° 1' 2' 0'</div> <div>55° 11' 10' 11'</div> </div> <div>Lyra rising.</div>
"	"	10. 6.10 "	21.53.49	
"	"	10.11.00 "	22.51.47	
"	"	10.16.00 "	31.26.21	<div> <div>141° 39' 9' 9'</div> <div>141° 28' 9' 8'</div> </div> <div>Jupiter rising.</div>
"	"	10.20.00 "	31.54.49	
"	"	10.25.20 "	33.20.24	<div> <div>358° 40' 2' 1'</div> <div>357° 12' 10' 11'</div> </div> <div>Polaris.</div>
"	"	10.30.30 "	33.25.20	
"	"	10.46.30 "	19.38.34	<div> <div>242° 20' 0' 1'</div> <div>242° 57' 8' 8'</div> <div>243° 40' 1' 1'</div> </div> <div>^a Hydræ setting.</div>
"	"	10.50.30 "	18.53.49	
"	"	10.54.40 "	18. 7. 3	
"	"			

Observations for Azimuth.

Date,	Station.	Time.	Observed Altitude.	BEARING.	
1840.					
April 21	Olipore,	6.41.00 P. M.	15.22.20	84° 0' 1' 1'	} ⊙ Altitude L. L. Bearing Centre.
"	"	6.44.00 "		85° 51' 1' 0'	
"	"	6.49.00 "	17.17.20	85° 40' 0' 39'	
"	"	6.54.00 "	18. 5. 1	86° 20' 0' 19'	
"	"	6.59.00 "	19. 5. 1	79° 49' 9' 50'	} ⊙ Altitude L. L. Bearing Centre.
"	"	6.28.15 "	12.55.51	80° 15' 5' 3'	
" 22	"	6.33.15 "	13.57.54	81° 41' 0' 0'	
"	"	6.38.20 "	15.	82° 23' 2' 2'	
"	"	6.43.15 "	16. 5. 1	83° 17' 6' 6'	
"	"	6.48.15 "	17. 7. 3		

These attempts at Azimuth observations were made with one of the small original Theodolites of Colonel Everest by Robinson, which I procured from Lieutenant Durant.

The Altitude arc had 2 verniers, the difference in the reading off generally amounting to 3' 4'.

The Azimuth arc had 3 verniers, two of which generally gave the same result, the third differing 1'.

Both verniers read off to single minutes.

In the column of bearings the three minutes readings are not given in full, the first figure of the second and third readings not being given, except when it differs from the first figure of the first reading.

Thus 80° 15' 5' 3' means, 80° 15' 15' 13'.

Thus 85° 40' 0' 39' means, 85° 40' 40' 39'.

The time was taken by a watch of ordinary merit, attempted to be corrected to apparent time by observations made either about the time of observation for Azimuth or during the same day.

I give the observations in the hopes they may lead to some approximation to the truth; they were the first I ever made, and I was quite alone.

Observed Altitude.

1840.			A. M.	Observed Altitude.	P. M.	
April	2	Pushut Fort,	..	⊙ L. L... = 100° 20' 00"	= 1.46	} Equal Altitudes.
"	3	..	..	10. 1.20 = 100.40.00	= 1.45
"	3	..	..	10. 2.20 = 106.00.00	= 1.44
"	3	⊙ L. L... = 96.20	= 1.59.10	} Equal Altitudes.
"	3	..	..	9.46.40 = 97.00	= 1.57
"	14	Olipore,	..	⊙ L. L... = 99.20	= 1.54.20	} Equal Altitudes.
"	20	Olipore,	..	9.27.35 = 99.40	= 1.54.30	
"	20	Olipore,	..	⊙ L. L... = 96.00	} Error 43" + Therm. 109. Bar. 27.25.	
"	20	Olipore,	..	9.47.15 = 96.30		
"	20	Olipore,	..	9.48.35 = 97.00		
"	20	Olipore,	..	9.50.00 = 97.30		
"	20	Olipore,	..	9.51.15 = 98.00	} Error 43" + Therm. 109. Bar. 27.25.	
"	20	Olipore,	..	9.52.36 = 85.40		
"	21	Olipore,	..	⊙ L. L... = 85.40	= 2.58.25	
"	21	Olipore,	..	8.57.30 = 86.00	= 2.57.40	
"	21	Olipore,	..	8.58.20 = 86.20	= 2.56.45	} Equal Altitudes.
"	21	Olipore,	..	8.59.15 = 86.40	= 2.55.50	
"	21	Olipore,	..	9. 0.14 = 87.00	= 2.55.00	

I add these observations for time, which are very indifferent; my watch having no second hand, besides it is difficult, if not impossible, for a single observer to make accurate observations for time.

I also subjoin attempts at ascertaining the longitude of Olipore by Astronomical observations, which are open to all the objections I have mentioned.

Observed Altitude,—(Continued.)

1840.

April	23	Olipore,	7.27.20	A.M.	17° 6' 2'	⋄	Altitude U. L.
"	"	"	7.29.00	"	25° 34' 30'	⊙	Altitude L. L.
"	"	"	7.30.30	"	110° 54' 10'		Lunar distance.
"	"	"	7.32.00	"	26° 8' 4'	⊙	Altitude L. L.
"	"	"	7.33.00	"	16° 26' 22'	⋄	Altitude U. L.
"	"	"	7.34.00	"	110° 52' 40'		Lunar distance.
"	"	"	7.35.00	"	16° 10' 6'	⋄	Altitude U. L.
"	"	"	7.36.30	"	27° 4' 0'	⊙	Altitude L. L.
"	"	"	7.37.20	"	110° 51' 20'		Lunar distance.
"	"	"	7.38.00	"	27° 24' 20'	⊙	Altitude L. L.
"	"	"	7.39.00	"	15° 39' 35'	⋄	Altitude U. L.
"	"	"	7.40.00	"	110° 50' 20'		Lunar distance.
"	"	"	7.40.10	"	15° 25'	⋄	Altitude U. L.
"	"	"	7.41.00	"	28° 13'	⊙	Altitude L. L.
"	"	"	7.42.40	"	110° 49' 40'		Lunar distance.

Observations for Time.

"	"	"	7.51.50	=	60.30.00	} Cloudy all the afternoon. Therm.
"	"	"	7.53. 6	=	61.00.00	
"	"	"	7.54.20	=	61.30.00	
"	"	"	7.55.32	=	62.00.00	
"	"	"	7.57.45	=	62.30.00	

For Longitude.

"	24	"	7. 0.35	=	26° 48' 44'	} ⋄ Altitude Upper Limb.
"	"	"	7. 1.35	=	26° 43' 39'	
"	"	"	7. 2.35	=	26° 28' 33'	
"	"	"	7. 3.35	=	26° 39' 39'	
"	"	"	7. 4.35	=	26° 29' 25'	
"	"	"	7. 6.35	=	20° 57' 52'	} ⊙ Altitude Lower Limb.
"	"	"	7. 7.35	=	21° 9' 4'	
"	"	"	7. 8.35	=	21° 21' 17'	
"	"	"	7. 9.35	=	21° 32' 29'	
"	"	"	7.10.35	=	21° 45' 41'	
"	"	"	7.11.50	=	99° 53' 40'	} Lunar distances, Sextant.
"	"	"	7.12.50	=	99° 53' 30'	
"	"	"	7.14.00	=	99° 53' 15'	
"	"	"	7.15.00	=	99° 53' 5'	
"	"	"	7.15.00	=	99° 52' 40'	
"	"	"	7.17.30	=	20° 29' 25'	} ⋄ Altitude Upper Limb.
"	"	"	7.18.30	=	25° 24' 20'	
"	"	"	7.19.30	=	25° 19' 14'	
"	"	"	7.20.30	=	25° 14' 10'	
"	"	"	7.21.30	=	25° 9' 4'	

For Longitude,—(Continued.)

1840.		h. m. s. A.M.		
April 24	Olipore,	7.23.00	,,	= 24° 18' 14'
,,	,,	7.24.00	,,	= 24° 28' 24'
,,	,,	7.25.00	,,	= 24° 40' 36'
,,	,,	7.26.00	,,	= 24° 54' 50'
,,	,,	7.27.00	,,	= 25° 6' 2'

⊙ Alt. Lower Limb.

Observations for the Time.

,,	,,	7.29.50	A.M.=	51° 20' 00'	} With Sextant. Therm. 75. Bar. 27.25. Error 43'' +.
,,	,,	7.30.35	,,	= 51° 40' 00'	
,,	,,	7.31.29	,,	= 52° 00' 00'	
,,	,,	7.32.18	,,	= 52° 20' 00'	
,,	,,	7.33. 3	,,	= 52° 40' 00'	
,,	,,	4.20.10	P.M.=	58° 00' 00'	} With Sextant. Therm. 80. Bar. 27.25.
,,	,,	4.12.45	,,	= 57° 40' 00'	
,,	,,	4.13.31	,,	= 57° 20' 00'	
,,	,,	4.14.25	,,	= 57° 00' 00'	
,,	,,	4.15.16	,,	= 56° 40' 00'	

For Longitude.

		h. m. s. A.M.		
,,	25	6.43.20	,,	= 66° 28' 00'
,,	,,	6.44.20	,,	= 66° 27' 00'
,,	,,	6.45.20	,,	= 66° 24' 50'
,,	,,	6.46.20	,,	= 66° 22' 40'
,,	,,	6.47.20	,,	= 66° 21' 00'
} Altitude. Upper Limb Sextant.				
,,	,,	6.49.00	,,	= 17° 26' 22'
,,	,,	6.50.00	,,	= 17° 39' 34'
,,	,,	6.51.00	,,	= 17° 50' 46'
,,	,,	6.52.00	,,	= 18° 3'
,,	,,	6.53.00	,,	= 18° 18' 14'
} ⊙ Alt. Lower Limb. Theodolite.				
,,	,,	6.55.00	,,	= 88° 36' 50'
,,	,,	6.56.00	,,	= 88° 36' 25'
,,	,,	6.57.00	,,	= 88° 36' 00'
,,	,,	6.58.00	,,	= 88° 35' 40'
,,	,,	6.59.00	,,	= 88° 35' 25'
} Lun. distances, Sext.				
,,	,,	7. 3.00	,,	= 65° 31' 00'
,,	,,	7. 4.00	,,	= 65° 26' 00'
,,	,,	7. 5.00	,,	= 65° 23' 00'
,,	,,	7. 6.00	,,	= 65° 19' 00'
,,	,,	7. 7.00	,,	= 65° 14' 50'
} Alt. Upper L. Sext.				

For Longitude,—(Continued.)

1840.		h. m. s. A.M.	
April 25	Olipore,	7. 8.28	" = 21° 23' 19'
"	"	7. 9.30	" = 21° 36' 32'
"	"	7.10.30	" = 21° 48' 44'
"	"	7.11.30	" = 22° 2'
"	"	7.12.30	" = 22° 15' 11'

⊙ Alt. Lower Limb,
Theodolite.

Observations for Longitude entirely with Sextant.

		A. M.	
"	"	7.16.00	" = 64° 30' 40'
"	"	7.17.00	" = 64° 25' 25'
"	"	7.18.00	" = 64° 20' 00'
"	"	7.19. 5	" = 64° 13' 40'
"	"	7.20. 0	" = 64° 8' 10'

} Alt. Upper Limb.

"	"	7.23.20	" = 48° 40' 00'
"	"	7.24.10	" = 49° 00' 00'
"	"	7.25.00	" = 49° 20' 00'
"	"	7.25.47	" = 49° 40' 00'
"	"	7.26.36	" = 50° 00' 00'

} ⊙ Alt. Lower Limb.

"	"	7.28. 5	" = 88.27.00
"	"	7.29.00	" = 88.26.25
"	"	7.30.00	" = 88.25.50
"	"	7.31.00	" = 88.26.50
"	"	7.32.00	" = 88.25.35
"	"	7.33.00	" = 88.25.30
"	"	7.34.00	" = 88.25.10

} Lunar Distances, Up-
per Limb.

"	"	7.36.30	" = 62.16.00
"	"	7.37.30	" = 62. 7.00
"	"	7.38.30	" = 61.59.00
"	"	7.39.30	" = 61.51.10
"	"	7.40.30	" = 61.44.00

} Alt. Upper Limb.

"	"	7.42.39	" = 56.40.00
"	"	7.43.20	" = 57.00.00
"	"	7.44.12	" = 57.20.00
"	"	7.44.55	" = 57.40.00
"	"	7.45.40	" = 58.00.00

} ⊙ Alt. Lower Limb.

"	"	9.31.54	" = 100.00.00 = 2. 7.34
"	"	9.32.44	" = 100.20.00 = 2.26.40
"	"	9.33.33	" = 100.40.00 = 2.25.45
"	"	9.34.25	" = 101.00.00 = 2.24.55

} Equal Alt. for
the time.

Observations for Longitude with Sextant.

1840.		h. m. s. A. M.		
April	26	Olipore,	7.21.00	" = 76° 8' 20' }
"	"	"	7.22.00	" = 76° 8' 20' }
"	"	"	7.23.00	" = 76° 7' 50' } Alt. Upper Limb.
"	"	"	7.24.00	" = 76° 6' 10' }
"	"	"	7.25.00	" = 76° 5' 30' }
"	"	"	7.27.50	" = 51° 40' 00' }
"	"	"	7.28.38	" = 51° 00' 00' }
"	"	"	7.29.22	" = 51° 20' 00' } Alt. Lower Limb.
"	"	"	7.30. 8	" = 51° 40' 00' }
"	"	"	7.30.58	" = 52° 00' 00' }
"	"	"	7.33.00	" = 76° 43' 20' }
"	"	"	7.34.00	" = 76° 42' 40' }
"	"	"	7.35.00	" = 76° 42' 50' }
"	"	"	7.36.00	" = 76° 42' 20' } Lunar distances, Upper Limb.
"	"	"	7.37.00	" = 76° 42' 20' }
"	"	"	7.38.00	" = 76° 41' 20' }
"	"	"	7.39.00	" = 76° 41' 25' }
"	"	"	7.42.00	" = 75° 27' 40' }
"	"	"	7.43.00	" = 75° 24' 25' }
"	"	"	7.44.00	" = 75° 20' 45' } Alt. Upper Limb.
"	"	"	7.45.00	" = 75° 16' 30' }
"	"	"	7.46.00	" = 75° 12' 20' }
"	"	"	7.48.39	" = 59° 20' 00' }
"	"	"	7.49.21	" = 59° 40' 00' }
"	"	"	7.50. 9	" = 60° 00' 00' } Alt. Lower Limb.
"	"	"	7.51.00	" = 60° 20' 00' }
"	"	"	7.51.48	" = 60° 40' 00' }

Observations for Time, Equal Altitudes.

		h. m. s. A. M.		h. m. s. P. M.	
"	"	"	9. 8.29	" = 91° 20' 00' = 2.51.20	"
"	"	"	9. 9.25	" = 91° 40' 00' = 2.50.32	"
"	"	"	9.10.17	" = 92° 00' 00' = 2.49.44	"
"	"	"	9.11. 9	" = 92° 20' 00' = 2.48.51	"
"	"	"	9.12. 2	" = 92° 40' 00' = 2.47.48	"

In submitting these observations, I beg that it may be understood that I do not claim for any, except those for Latitude, even a tolerable amount of correctness. They are only the attempts of a tyro, under considerable disadvantages; and I dare say are rendered worthless by omissions, and even by absurdities. I have no theoretical knowledge of the subject whatever. Symes Nautical Tables have been my guide, and I have endeavoured to follow him, to the best of my ability.

I should not have ventured to submit those for Azimuth, Time or Longitude, did I not believe that no more competent person than myself has been at Olipore.

Grammar and Vocabulary of the Cashmiri Language. By M. P. EDGEWORTH, Esq. Bengal Civil Service.

When stationed at Lodihana in 1839, I was induced to attempt to learn the Cashmiri language, in consequence of the large Cashmiri population at that place, many of whom understand no other language, and the necessity of an interpreter in a Police office, I felt to be exceedingly objectionable. With the assistance of Meer Saifuddin, a respectable Syud of Cashmiri birth, I drew up some rudiments of the Grammar. Although these are necessarily very imperfect, and no doubt require numerous corrections, which I should have been able to give, had I been able to prosecute the study further, yet they will be interesting, as throwing some light on what appears to me a very intricate and peculiar dialect.

Alphabet and Orthography.

The Cashmiri language being a derivation of the great Sanscrit stock it has an alphabet of the Nagari form. This is only understood by the Hindoos. The translation of the New Testament published at Serampoor is in this character, and I was able to ascertain the force of most of the signs used in it; but as they do not complete the Alphabet, and I had no means of ascertaining their correctness from any Hindoo Cashmiri, I refrain from giving it.

The cerebralt. and the aspirates of the Nagari are all used, and an additional letter *a* and its aspirate *ts.* and *ts,h*, exactly the German *z* with or without an aspirate; this is represented in the Persian alphabet by ژ—As numerous Arabic and Persian words have been introduced, the whole of that alphabet has been incorporated with that portion, equivalent to the Nagari, as in Hindostani.

The great peculiarity of the language consists in possessing three very short vowels, which my instructor denominated the *ním fathe*, *ním kasra* and *ním zamma*, and possessing respectively the forces of a very short *a*, *i*, *u*. It is impossible to give a description in writing of these very peculiar half-vowels. To represent them, I have used the above vowels with a dot, *ä*, *ï*, *ü*.

There is likewise a short *o*, "*zamma majhúl*," and its corresponding half-vowel.

General Remarks.

The language resembles Hindostani in the two most troublesome parts of that language, but with increased difficulties. The genitive case agrees with the object possessed in gender, number and case having moreover different forms according as the possessing noun is itself masculine, feminine, or neuter.

In like manner the past tenses of the verb agree with the object, while the agent has a peculiar form, which I have termed the agentive case; but the verb agrees in some measure with the agent, as well as the object; at least assumes a modified form according to the person and number of the agent. The verb is in like manner subject to modifications of its termination, where the enclitic pronominal dative is used.

The verb is generally placed in the middle of the sentence as in English; but the object is indifferently placed before or after it.

In forming feminines, the letter of the masculine is generally changed thus:—

m.

d—g—zorj.

t——ts.

k——ch.

n——nj. (the nasal na of the Nagri,) ñ of the Spanish.

l——j.

Nouns.

The genitive is formed by adding as the case may be.

	<i>m. s.</i>	<i>an.</i>	<i>m. p.</i>	<i>f. s.</i>	<i>f. p.</i>	
S. Masculine	Sand	(an)	sandi	sanz	(ac)	sanza sindes* In all but proper names.
Feminine, or	hand	(a)	handi	hanz	(za)	hauza Plural in all genders and
Neuter	uk	(ik)		ich	(icha)	and cases.

The accusative by the addition of *as* or *is* in the singular, and *au* in the plural, thus:

Singular.

{	Nom.	Mäül, <i>a father</i>	Nichu, <i>child</i>	In proper names the genitive is formed by simply adding <i>un</i> , as
	Gen.	Mälü, sand, &c.	Nichu, sand	
	Ac.	Mális	Nichavis	
	Agent.	Mäil	Nichavi	

Plural.

{	Nom.	Máil	Nichavi	Nom.	Nushírwán,
	Gen.	Máilan, hand	Nichavin, hand,	Gen.	Nushirwánun
	Ac.	Máilan	Nichavin		
	Ag.	Mailaw	Nichvau,*		

Singular.

{	Nom.	Gabur, (son)
	Gen.	Gabra sand
	Ac.	Gabras,
	Ag.	Gabran,

Plural.

Nom.	Gabar,
Gen.	Gabran, hand
Ac.	Gabran,
Ag.	Gabrau,

Feminine.

<i>Singular.</i>	{	Nom.	Máj, mother,	tsut, bread
		Gen.	Máji, Majihand,	tswachi,—hand
		Ac.	Máji,	tswachi,
		Ag.		

<i>Plural.</i>	{	Nom.	Máji,	tswachi,	
		Gen.	Májan, hand,	tswachan, hand	
		Ac.	Májan,	tswachan,	
		Ag.	Májaw,	tswachaw,	Agentive also with
		Ab.			<i>filled</i> —ablative.

Neuter.

Nom.	Nág, had, fountain	garu, house
Gen.	Náguk, ich, ik, icha,	garuk, ich, iki icha.
Ac.	Nágas	garas
1st Abl.	Nága, nishi, &c.	
2d Ab.	Nági, khota, &c.	
Nom.	Nag,	gar
Gen.	Nágan hand, &c.	garan hand, &c.
Ac.	Nágan,	garan

* This word in the Serampur Testament is spelt nits, hu.

Personal Pronouns.

	1.			2.			3.		
Nom.	I,	Bo	We, Asi	Thou, tiü	You, Túi	He, sú	They, Tim		
Gen.	of me, Mi*	us	sa*	Chá*	Tuh**	Tih***	Tih	* Genitival terminations. m. <i>f. s.</i> <i>f. p.</i> ànyu, àryi, àymy, ànyèy, ànis.	
Acc.	to me, Mih	us	asih	Tsih	Tohih	tas or	timan	** hand, hanz, handi, hanza handas. is	
Inflected.	me, Mi	us	asi	tsi	Tohi	timis	timay	*** Also ta and time with <i>súnd</i> , &c. sanz, sandi, sanza.	

Demonstrative and Relative Pronouns.

Nom.	Ih	ya or yim, or am or a.—sand &c.**	yamikü,* or ami.**	yim or yima.	* The genitival terminations of the neuter are iku, íchs, ikí, íchi.
Gen.		Yamis or amis**	yat or at**	yiman haud &c.	
Acc.		Yaimis.	yata or ami**	yiman	
Inflected.		m. Yim f. Yami		yiman yimon	** This form is used in a particular or proximative sense.
Nom.	Hú	Humi s & c.	humiku.*	hum, hume	See as above, without distinction of gender.
Gen.		Humis	hut	human haud.	
Acc.		Humis	huma	human.	
Abl.		Hwim		humou.	
			</		

*Adverbs.**Prepositions.*

much, seta yits, tsor, tseri, tsar
 little, maine—kam
 without, nibar
 within, andar
 above, hyùr
 from above } heri pita
 upwards, }
 downwards bon
 below, tal
 before, boút
 after, pat, patí
 directly, tikan, wil
 yesterday, yow
 day before } átra
 yesterday, }
 to-day, az
 to-morrow, pagah or rúts
 day after } kálkyat
 to-morrow, }
 together, sait

Conjunctions.

p. h.

Even *ٻي* i
 and, ta, or be
 or ya, kina ?
 though,
 although, yudunte, agarche
 since, yelli
 because, yowkani
 if, yudwai, hargahai, hargah, or *ai*
 added to the nominative
 but, lekin, ama
 unless, nai

m. f. m. p. f. p.

except, magar, yátü, yáts, yáti, yatsa
 then *ٻيس* adi
 therefore, awai or awai khatir
 else, nata
 either,

from, nishi-pita ; a after a poss.
 by, nishi
 to, not
 upon, pèt
 after, pat
 before, borit borita
 with, seit, swán
 without, ru'st
 near, nish
 in, andar

m. s. f. s. m. p. f. p.

for, kyut, kylits, kyit, kyits
 on account of, khatir, after genitive
 between, manz, manzbag
 towards, kun
 than, (com- } khota
 parison) }
 except, (but) yatu, siwa, warai, rust

m. f.

equal to, yatu, or *sambü, sambü asamb*
 just now, àdi
 also, ti
 like, }
 although ! } zan

sait, meaning *with* governs the accusative

sait, meaning *by means of*, governs the genitive or the case in *au* in plural.

andra, between, governs “*i*” in singular, “*au*” in plural.

khota, without, governs genitive, or accusative in plural, and in the neuter, the ablative in “*i*.”

Pronouns and Pronominal Adjectives.

Some.	m.	kats	kaiti	kaityah	katsan
(several)	f.	katsa	katsa	kaitsah	kaithyan

Any.	<i>m.</i>	kunh	kaúh	koutshah	kainsi
	<i>f.</i>		kaúh	kautshah	
Some. (few)	<i>nom.</i>	kiuh,	keutshah,	k	
	<i>obj.</i>		keutsau.		
Such. (taisa)	<i>m.</i>	titú,	<i>accus.</i>	tithis	<i>pl.</i> titi tithan
	<i>f.</i>	titsa		titsi	titsaha titsan
Kaisa.		kitú or kihü	kithis, kihis	kiti, kihi	kithan, kihan
		kitsa or kish	kitsi, kishi	kitsaha kishi	kitsan, kishan
Jaisa.		yutü	yithis	yiti	yithan
		yitsa	yitsi	yitsahä	yitsahan
Aisa.		hutü	huthis	huti	huthan
		hutsa	hutsi	hutsaha	hutsahan

The termination *m.* hut, hatî, *f.* hats, hatsa, is equivalent to the Persian *nák*, or English "full."

Verbs.

The substantive and auxiliary verb "to be," "to be to," *i. e.* to (have, with dative and indicative.)

1. Present Indefinite.

1	♂	chhus, am	chhi	chhum	chhu
	♀	chhes	chhe	chhem	chhe
2	♂	chhukh	chhiwa	chhwi	chhowa
	♀	chhekh	chhewa	chhi	chhewa
3	♂	chhú	chhi	chhus	chhukh
	♀	chhé	chhí	chhis	chhekh

2. Past Indefinite.

1	♂	ásus, was	áis	ásum	ásü
	♀	Ases	áäsä	ásem	así
2	♂	asukh	áséwa	áswi	ásuwa
	♀	ásekh	ásewa	ási	ásewa
3	♂	áüs	áis	ásus	ásukh
	♀	áäs	áäsan	áses	ásekh

3. Aorist, or Future, May or will be.

1	áäsa	áäsaw
2	áüsakh	áäsyú
3	áäsi	áäsan

4. Present Definite, am

ásán chhus, &c. ásanchhum, &c.

5. Perfect, have been

ásán ásus, &c. ásán ásum, &c.

6. Imperfect, was being

a'smut chhus, &c. a'smut chhum

7. *Pluperfect*, had been.

a'smut a'sus a'smut a'sum

8. *Conditional Past*, might have been.

ásmut áasa, &c.

V. A. *Intransitive*, bihun, to sit; wathun, to stand up; pyun, to fall.

Imperative.

s.	{	2. bih, sit	wath	pi
		3. bihin, let him sit	wathin	piyin
pl.	{	2. bihyü	wathyú	piyú
		3. bihin	wathin'	piyin

Aorist, or Future.

s.	{	1. biha	watha	pima
		2. bihakh	wathakh	pikh
		3. bihi	wathi	piya
pl.	{	1. bihow	wathow	pimow
		2. bihyú	wathyu'	piyu
		3. bihan	wathau	piyan'

Present.

withan, chus piyán' chhus
 ——— chhukh
 ——— chhu, &c. &c.

Imperfect.

Bihan ásus
 ——— ásukh
 ——— áus, &c.
 ——— asa
 ——— asakh
 ——— asi, &c.

Feminine.	{	Byuthus	wuthus	pyos
		byuthukh	wuthukh	pyokh
		bihuth byúth	woth	pyou
		bethi	wuthi	
		bethwa	wuthiwa	
		bethi	wuthi	
		bethis	wutsus	
		bethikh	wutsekh	
		beth	wuts	
		becha	wutsa	
	{	bechawa	wutsewa	
		becha	wutsa	

Perfect.

Pluperfect.

m.	s.	1.	byuthmat chhus	asus	wuthmit
f.	s.	1.	bethmits chhes		watsmuts
m.	p.	1.	bethmit chhi		withimit
f.	p.	1.	bechamatsa chhe		watsimatsa
			behawun		bihunwal

*I Mood.—Tenses, with
Objective Inflections like
the Future.*

	1	2
	kar,	karan
2	— karin	karinas
3	— karyū	kar yun
2	— in	— inas
3		

1	kar-a
2	— akh
3	— i
1	— ow
2	— yu
3	— au

karán	chhus
—	chhukh
—	chhu
—	chhi
—	chhawa
—	chhi
—	chhes
—	chhekh
—	chhe
—	chhe
—	chhewa
—	—
—	chhe

Feminine. Masculine.

Active Transitive Verb—karun, To do.

I.—Imperative—do.

3	4	5
karakh	—	—
— urakh	aninye	aninawa
— yukh	—	aninawe
	aninai	—

II.—Aorist or Future. Will or may do.

kar-akh	kar-at	kar-awa
— ahakh	—	—
— ikh	t'	— iwa
— owkh	— owt	— owa
— yukh	—	—
— auakh	— aui	auawa

III.—Present. Am doing.

chhusakh	chhusat	chhusawa
chhuhakh	—	—
chhukh	chhwi	chhúwa
chhikh	chhit	chhewa
chhawakh	—	—
chhikh	chhwi	chh'íwa

chhesakh	—	—
chhehakh	—	—
chhekh	—	—
chhekh	—	—
chhewakh	—	—
chhekh	—	—

The same as I. with *asi* added

chu-asi.

chhum

7

IV.—*Imperfect.* Was doing.

karan' ásus ásus-au ásus-akh ásus-at ásus-awa &c. &c.

V.—*Imperfect.* Might be doing.

karan' asa kuan'-asau &c. &c.

VI.—*Respectful Imperative.* Please to do.

2 karta kartan
3 karitan karitanas

2 kartyú karyun
3 karitan karitanas

Infinitive.

m. s. karun m. p. karani f. s. karany f. p. karaniya

Present Participle.

m. s. koronwául, declined like maül

or korowunnü

f. korouwaj

korowvajyay

pl. kor-onwajiniye

—— iwaiinya

Perfect Participle.

korit, indeclinable.

II.—Tenses with Objective Inflections, like the Past Indefinite.

		Objective.		3d Person.		Dative.	
		singular.		plural.		2d Person.	
		singular.		plural.		singular.	
		plural.		plural.		plural.	
		im-tim		imúa		—	
		it		—		—	
		in		inawa		—	
		ü		inawa		—	
		üwa		—		—	
		ikh		ihawa		—	
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Pluperfect 1st form.

Perfect.

Pluperfect 2d form.

Obj. Feminine.

Agt. Pl. Agt. S.

1 kom yaiyam
2 — yaitha
3 — yaiyan
1 — yaiya
2 — yaiyewa
3 — yaiyekh

karimits chhem
— chhiyai
— chhes
— mitsi chhe
— chhewa
— chhekh

karimits ásem
— ási,
— áses
karimitsi ásu
— ásewa
— ásekh

Past Conditional.

Karnut asi, &c. &c.

The changes in termination for the enclitic object follow this rule—s. of 3d person before akh, as, asi, becomes ⁿkh h

In the 2d singular *th* is inserted after the open vowel.

The *i* of masculine becomes *e* in feminine.

a or u of singular becomes *i* in plural.

The enclitic pronouns used with verbs are :

Accusative.	Dative.
(him) su (them) tim	s. p.
thu tsi ye tuih	tás timan
me *bu us asi	aitzi tuih
(*often omitted.)	mih asi.

General Observations on the Verbs.

The negative is formed by adding *na* in all tenses except the *common* imperative; and in compound tenses it is added to the auxiliary, not the participle, for the auxiliary and participle may be separated and dislocated at pleasure, *chhus na korán* or *korán chhus na*. The interrogative is formed by adding a *fatha* to a silent consonant or a dissimilar vowel. If the vowel be *fatha* it is lengthened into *ā*, the expletive *ma* is sometimes used, if negative interrogative *ná* is used instead of *na*.

In the imperative *m* or *ma* is prefixed instead of *n* affixed, except in the imperative in *zí*, when *na* is used as usual.

Intransitive verbs agree with their nominative in number, person, and gender.

Transitive verbs agree with their object and nominative in gender, number and person, with their agent in number and person, but not in gender in the past tenses, *i. e.* of the second mode as,

A man called a woman
Mahnivi manjin zanána

A man called a man
Mahnavi mangan mahnyu

A woman called a woman
Zanáni manjin zanána

A woman called a man
Zanáni mangan mahnyu

The passive is formed by declining *Yun*, to come, with the passive participle in "*mut*."

The causal verb is formed by adding "*náwun*" to the root, as *sherun*, to adorn; *shernáwun*, "cause to adorn."

Form of Verbs of Quality. As *Pranun*, to be white.

Imperfect.	Aorist.	Past. Masculine.	Feminine.	Participle, (sifat.)
Pran	prana	pran yús	yiyas	m. s. pranyo' mutü, pl. miti
Pranin	— akh	— yukh	yiyakh	f. s. — mitsi, pl. matsa
	— i	— yó	yíya	or pranyimitsi
	— au	— yai	yíya	Second Participle or Adjective.
Pranyu	— yu	— yawa	yíyíwa	m. s. pranu
Pranin	— an	— yai	yíya	f. s. prany

Substantive derived thence, pranyer whiteness.
 Transitive Verb ditto, panyaráwan to whiten.

Similar to this are the following:—

Infinitive.	Participle.	Mas. Fen.		Substantive.	Transitive Verb.	English.
anun	anyomut	s. anu	p. anyi-ya	anyar	anyarawun	be blind
ats, hun	ats, hyomut	s. ats, hu	p. ats, h-ye	ats, har	ats, harawun	be lazy, sust
badun	badyomut	s. badu	p. bad- baji	bajar	badráwun	be large
budun	budyomut	s. budu	p. bud- buji	bujar	budráwun	be old
chhunun	chhunyomut	s. chhunu	p. ny- nyiya	chhunyar	chhunyárun	be less
chhetun	chhetyomut	s. chhetu	p. chhets- a	chhetsir	chhetsarawun	be white
darun	daryomut	s. darü	p. dar dare	darir	dararáwun	stammer
dúrun	dúryomut	s. dúru	p. dúr dúra	dúrir	dúraráwun	be far

<i>Infinitive.</i>	<i>Participle.</i>	<i>Mas.</i>		<i>Fem.</i>	<i>Substantive.</i>	<i>Transitive verb.</i>	<i>English.</i>
halun	halyomut	s. p.	- i	s. p.	gachar	gachrawun	straight
halun	halu	- i	- i	gat gacha	hajar	halrawun	crooked
halun	hibu or byù	- i	- i	haj-haja	hishar	hishar	like
kalun	kalyomut	- i	- i	kaj-a	kajar	kajrawun	dumb
kánun	kányomut	- i	- i	kány-ya	kanyar	kanyarawun	one-eyed
kochnun	krehyomut	- i	- i	ny - ya	khnyar	krehyarawun	black
lidrun	lidryomut	- i	- i	- - - rih	lidrir	lidrawun	yellow
lókun	lókyomut	- i	- i	luh - i	lóchar	lukrawun	small
matun	matyomut	- i	- i	mats - a	matsar	matsarawun	mad
míthun	mithyomut	myuth, metts	i	mitts, michhi	michhar	mithrawun	sweet
nanun	nanyomut	nanu	- i	ny, nyige	nanyar	nanyarawun	evident
nílun	nilyomut	nyul, neli	- i	nej, neja	nejar	nijrawun	blue
nunun	nunyomut	munu	- i	ry ryia	nunyar	nunyarawun	salt
sanun	sanyomut	sanu	- i	ry ryiya	sanyar	sanyarawun	attentive
sidun	sidyomut	sidu	- i	siz - a	sizar	sizrawun	straight
títhun	thidyomut	thadu	- i	theg - a	thazar	thazrawun	tall
tsukun	tithyomut	títhu	- i	titts, ticka	tichar	tithrawun	bitter
ts, hethun	tsukyomut	tsuku	- i	tsuk - a	tsukar	tsukarawun	acid
woz, hethun	tshekyomut	tsotu	- i	tshot, tshochi	tshochar	tshotrawun	short
zethun	wozalyomut	wozalu	- i	wozaj, wuzaj-a	wozjar	wozlawun	red
	zethyomut	zyutts, zeth	i	zeth, zechhi	zechhar	zithrawun	long
nyakan	nykyomat	nyuk					
vyethun	vyethyomut	vyuth					
	nyki	nichh	nichha	nichhar	nykrawan		be little or thin
	vyethi	vyith	vyichhi	vyechhar	vyethrawan		

Past Indefinite.

1	gayes	áyēs	moyem	lutshes	ruzas	tajis
2	gayekh	áyekh	moyekh	lutshikh	ruzekh	&c.
3	gaye	áye	moye	lutsh	ruz	
1	gaye	áye	moye	lotsha	ruza	
2	gayewa	áyewa	moyewa	lotshawa	ruzawa	
3	gaye	áye	moye	lotsha	ruza	

*Feminine.**Pluperfect.*

m.	1	gayáu	moyas	lotshau		
f.	1	gayái	moyaye	lotshaye		

Participle-perfect, Pluperfect, &c.

m.	s.	gomut	ámütü	lotsmut	rudmut	togmut
m.	p.	gomiti	ámítí	or lostnut		togmiti
f.	s.	gomuts	ámíts	lotshmuts	ruzmut	tijmits
f.	p.	gomutsa	ámítsa	lotshamutra		tijmitsa

Infinitive.

		gats,han	marun	turun	rozun	tagun

Infinitive.

Déhsar, To see.

Imperfect.

Caut,

Masculine.

Dyútham.

—— ut.

Dyúth.

Aorist.

Desha.

Participle.

Deshan.

*Past.**Feminine.*

Déthim.

Déthit.

Déts.

Participle.

Dyúthmut.

Dyúthmiti.

Déthmits.

Déthmitsi.

A.

Anun, *v. a.* to bring.Anun, *v. n.* be blind.Atsun, *v. int.* go in.

tsáu

tsái

Alun, *v. n.* to nod head.Alráwan, *v. a.* to make nod.Asun, *v. n.* to laugh.Apuz, *s. m.* a lie.Apuzyar, *adj.* false.Ashü, *s. m.* tear.Achhü, *s. f.* eyeAchur, *f. m.* word.

Agur, uncut (wood.)

Anü (*pronounced ün*) blind.Ainy, *fem.*Anachiwa, }
gagür, } musk rat.Agun, *s. f.* fire, (especially for
cooking, while Nár is any fire.)

Athá, loose, also hands.

Ant, }
Anchi, *pl.* } stone (of fruit.)Adij, }
Adja, } *s. f.* bone.

Adyul, large bone.

Alü, plough.

AI.

Ail, *s. f.* cardamum.Athij, *s. f.* paste.

Aïr, hunting.

B.

Behun, *ہیوردن* to sit,
 Bazun, to hear or understand.
 Bázu, regular.
 Bagrun, *v. a.* to share.
 áwan, *v. a.* to divide.
 Bawun, *v. a.* to explain.
 Buzun, to fry.

Batu, cooked rice.
 Baya, female.
 Buth, *s. m.* face.
 Báts, *s. m. p.* people.
 Bachhera, fool.
 Bungir, *s. f.* "churi," bracelet.
 Bunj, *s. f.* plane tree.
 Bai, brother.
 ikakin, brother's wife.
 putr, brother's son.
 waza, brother's daughter.
 Bagü, *s. m.* share.
 Benji, *s. f.* sister.
 Braür or byaur, }
 Bráir, } cat.

CH.

Chyun, to drink.
 Chapán, to hide (in a place,) or
 tsipun (from a person.)

Chapat, *pl. ts. s. f.* slap.

CHH.

Chhewun, be drunk.
 Chhevyar, (as pranun.)
 Chhihun, *v. a.* to tease.

D.

Dawun, }
 Dorun, } to run.
 Deshun, to see.
 Dyutar, *p.*
 Detin, *i* imperative caret.
 Dyutmut.
 Detmits.
 Dawun, *v. a.* to cause, to give.
 Dazan, *v. n.* to burn, or be burnt.
 Dyun, to give, shut, tie.

Dädu, *s. m.* pain.
 Dányu, rice, growing.
 Duni, whip.
 Diuth, }
 Dreuth, } sight.
 Dolá, oblique.
 Dwod, *s. m.* milk.
 Dand, *s. m.* bull.
 Dallun, *v. n.* pass, to pass by, to
 pass from.
 Dollmut, to blow.
 Dalán, *v. a.* transitive of the above.
 Dálmüt.
 Dajmits.

G.

Gonzurun, <i>v. r.</i> to think, count.	Gotsur, <i>s. f.</i> small purse.
Grezun, to roar, (tiger, river.)	Garu <i>s. m.</i> house.
Garun, to cut, (as a carpenter,) make (as an ironsmith.)	Gurü, <i>s. m.</i> horse.
Gewun, <i>v. n.</i> to sing.	Gad, <i>s. f.</i> fish.
Gyo, <i>m. and f.</i> the same.	Gádáháuz, fisherman.
	Gub, <i>s. f.</i> sheep.
	<i>adj.</i> also pregnant.
	Gagür, <i>s. m.</i> } ir, <i>s. f.</i> } rat.
	Gwadü, <i>s. m.</i> by, below the knee, stem of a tree.
	Gáthu, wisdom.
	ul, <i>m.</i> } ij, <i>f.</i> } <i>adj.</i> wise.

H.

Harahar, dispute.	Hárun, to lose in play.
Hít, pretence.	Hyun, to take.
Háts, <i>s. f.</i> false accusation.	Hyikun, to be able.
Hún, <i>s. m.</i> } Húiry, <i>s. f.</i> } dog.	Háwun, <i>v. a.</i> to show.
infl. Háin.	Hana, <i>v. f.</i> a little not used with grains or as a diminutive Gor hana, a small horse.
Hórun, <i>v. a.</i> to repay.	Hí, jasmine.
Halun, (in sco)	Hí-asmán, lilac.
Halyómut.	Harana, antelope
	Hángaul, deer.
	Háuz, boatman ; not inflected, in the agentive case.
	Hichhun, <i>v. a.</i> learn.
	Hichhnáwan, <i>v. a.</i> teach.
	Haud, <i>s. m.</i> ram.
	Hash, <i>s. f.</i> mother-in-law.
	Hár, <i>s. f.</i> cowrie.
	— <i>s, m.</i> necklace.
	Hól, hil, <i>m.</i> } Haj, haji, <i>f.</i> } crooked.

H.

Hol, *s. m.* waist.Hárinj, *s. f.* bow.Hól, *s. f.* flabergastation.

K.

Karun, to do.

Kreshun, to desire.

Krushmut.

Krushmits.

Krehnun, to be black.

Khasun, to mount.

Kunun, to sell.

Kobun, (in sco) be hump-backed.

Katurun, to cut in two.

Kadun, to draw.

Kath, *s. f.* word.Káum, kami, *s. f.* business.

Krek, cry, lament.

Kallá, *m.* head.Kath, *s. m.* beam, gallows.

Kautúr, cock sparrow.

Kastúr, *s. m.* nightingale.*s. f.* musk.

Kéns, younger in age.

Kulü, *s. m.* tree.Kuj, *s. f.* plant.Kol, *s. f.* small river.Kub, *s. m.* hump-backed.

Kobyar.

Kuthü, *s. m.* room.Kath, *s. m.* sheep, ram.Kaú, *s. m.* arrow.

Kor or khwar, foot.

Kutú, *s.* knee.Kokúr, *s. m.*— ir, *s. f.* } cock and hen.Kaúr, *s. m.* neck.

KH.

Khyun, to eat.

Khandá wao — shálbáf.

Khasún, }
khout, } to mount, (used
kháits, } with took to form)Kachul, *s. m.* }
Kat, *s. f.* } goat, *vulgar.*Khotsun, *v. s.* or *v. t.* fear.

Khon, or khonwath, elbow.

Kharun, *v. a.* causal of Khasun,

Khanum, to engrave to dig.

L.

Layun, layu, to beat, (<i>lay on</i>).	M Lat. <i>f. a.</i> a time, pl. <i>lata</i> .
laya, regular.	Lór <i>s. f.</i> stick.
Lagun, <i>f. p.</i> lajis, <i>imp.</i> lag, } <i>attach</i>	Led, <i>adj.</i> cowardly, indeclinable.
gyin, lagmut, lajmitz. } <i>lagna</i> .	Lār <i>s. f.</i> house.
Larun, laryau, yaye, run after.	Lar, <i>s. f.</i> fighting, <i>thread</i> .
Lābun, to find.	Loh, <i>s. f.</i> caracal.
Ladun, to send (a thing.)	Liul, <i>s. m.</i> large earthen pot.
Ladmut, to put (a thing), into	Leji, <i>s. f.</i> small ditto.
(Lazmits, to hang), up or put a	Lang, <i>s. m.</i> thigh, large brand.
thing up or build, &c.	
Likhun,	
or Lékhun, Likhmut, } to write.	
hichh'mits,	
Ledun', <i>v.</i> (in sco,) be cowardly.	
Lasun, <i>v. a.</i> to live.	

M.

Mangun, to demand, in <i>f. g.</i>	Máránwatul, sweeper.
changed to j., maugmut,	Maúl, father.
maujmits.	Maij, mother.
Mathun, to rub, <i>f.</i> mots.	Múth, mut, forgetful.
Mashun, to forget.	Mandáct, modesty.
Muthmút.	Mal, <i>s. m.</i> (Arabic), property.
Mathmits.	<i>s. f.</i> necklace.
Mashráwan, to forget.	Mok,hta, <i>s. m.</i> pearl.
	Mauchh, <i>s. m.</i> honey.
	—— tilo, <i>s. f.</i> honey bee.
	Minyamar <i>s. f.</i> hind; (form of
	Hangal.)
	Musht, <i>s. f.</i> blow.
	Moth, <i>s. f.</i> handful.
	aply apl., chi, handle.
	Mudr, sweet.
	Mur, <i>s. f.</i> fowl-house.
	Mar, serai.
	Mast, <i>s. m.</i> hair of the head.
	Mäts, arm.

N.

Nerun, <i>v. int.</i> to go out, irregular,	Nag, <i>f.</i> eye.
<i>past</i> , drao and <i>imp.</i> ner, niri	Nag, <i>n.</i> lead.
put pethydráūmut nemwun.	Nichu, child.
<i>past participle</i> , nirit.	Nauga. } naked.
Nyún, to bring, as yun, nyu, nuj.	Nithnan. }
<i>f. p.</i> nyumut.	Nath-nati, <i>s. f.</i> trembling.
Nawun, be born, be near,	Naw, nivi, new.
<i>v.</i> (in esco.) Ho.	Navyar, newness.
Nawráwan, to make new.	Nakh, <i>s. m.</i> shoulder,
<i>v. a.</i> invent (a story.)	Nakha. } near.
Nahun, <i>v. a.</i> } to obliterate.	—— tal. }
Nashun, } (obsolete.)	Nai, <i>conj.</i> if not.
Nyikun, to become thin (in sco.)	Nyatr, marriage.
Nikráwan.	Nyúk. }
Nal tsunun, to wear.	Niki. } thin.
	Nich. }
	Nichha. }
	Nichhar, thinness.

O.

Onguj, <i>s. f.</i> finger.
Ongul, <i>s. m.</i> finger's breadth.

P.

Pushurun, <i>v. r.</i> to make over.	Paz, <i>s. m.</i> truth, pazi, <i>f.</i>
Parun, <i>v. a.</i> to read,	Puzyár-ing, true.
Pyun, to fall.	Pish, flea.
Pyau, } pyai.	Periga, <i>s. f.</i> arzun, chhini, millet.
Peyi, } peyi, (as gatsun.)	Poribar, <i>s. f.</i> shawl.
Páwan, to throw, (find sometimes.)	Put, <i>s. m.</i> } plank,
Parzanun, } recognise.	Pett, pachhi, <i>s. f.</i> } <i>f.</i> small.
or	
Parzanáwun, }	an, <i>m.</i> leaf, thread.
Pránun, <i>v. n.</i> (in esco) be old.	Pán, self.
Pazi, a defective verb, signifying or	Patsh, trust, belief.
to be made, be sure, or	Parzán, acquaintance.
proper.	Posh, flower.

P.

Prarun, <i>v.</i> (in sco.) to wait, for.	Práji, <i>s. f.</i> straw.
Presun, <i>v.</i> to bring forth, object.	Pránun, old.
Pyayi.	Páth durib, manner.
	Pütsalau, fox.
	Prat, every, (as every day, prat dolu.)
	Parbat, <i>s. m.</i> hill.
	Padü, <i>s. m.</i> sole or print of foot.
	Pâz, hawk in <i>agente</i> case, paz not pazan.

PH.

Phérun, <i>v. n.</i> return.	Phamb, <i>s. m.</i> cotton or shawl wool.
phyor.	Phras, <i>s. m.</i> poplar.
phýr.	Phyur, <i>s. m. pl.</i> phíri, dress branch of flowers.
Phirun, <i>v. a.</i> turn.	Phyúk, <i>s. m.</i> shoulder.
Phalun, to grow old, <i>f.</i> phaji, also to assess; phylana, clothes.	
Phalwun, <i>h</i> in <i>fem.</i> transition of the above.	
Phulun, to flower.	
Phulanawan, transitive.	

R.

Ráwun, <i>v. n.</i> to lose, lost to.	Rats, <i>s. f.</i> night.
Rawrawun, <i>v. a.</i> to lose.	Rus, <i>s. m.</i>
Riwun, <i>v. n.</i> to success, especially in kishtawár ryü.	— kat, infl. ch. <i>f.</i> } deer.
Ruchhun, to keep.	Rátnahún, wolf.
Rachhit thawán, to take care of.	Rúd, <i>s. m.</i> rain.
Ranun, to cook.	Rwáh, <i>s. m.</i> fault.
	Rët, <i>s. m.</i> month.

S.

Sozan, to send a man.	Swan, <i>s. m.</i> gold, a second. <i>s. f.</i> the relationship of one wife to another, <i>amabák.</i>
Saman, samyou, to assemble. to samyaiyü, to unite, resemble.	

S

- Shubun, to be fit, proper or rather, or becoming. Samatsár, participial acting, from Saman, meaning *united*.
 Súwun, *v. a.* to sew. Suit, *s. m.* wax (more generally used.)
 Säh, lion.
 Siming, lioness.
 Swar, *v. a.* slow music.
 Sangur, *s. m.* mountain.

SH.

- Shungun, Shong, Shurúg, Shwinj, Shwinja, to sleep. Shála, *s. m.* Pan. italicum, millet.
 Shur, *s. m.* a child of either sex.
 Shichh, information.
 Shál, jackall.

T.

- Tráun, *v. a.* to leave off. Tamul, *s. m.* rice uncooked or tuna, when used with phalle.
 Tráwanáwan, to make, to leave off. Tarukh, *s. m.* star.
 Tawit tsunun, to throw away. Tilr, *s. f.* bee, wasp.
 Táüth, *adj.* Taithi, *m.* love, friendship.
 Taith, Tachha, *f.*
 Tyuth, tuh, bitter.
 Tinj, *s. f.* string, (to tie, dyún,) to give.
 Tál, *s. f.* talyun, *s. m.* top of head, *s. m.* gum of mouth.

TH.

- Thawun, to place. Thäri, *s. f.* bush, bushy plant.
 Thurun, to make, *form*. Thar, *s. f.* back.
 Thíya, in presence of, evidently.

T.

- Tikun, to run, *n.* haste.
 Tikyou, tikyye, *v.*

TH.

Thahrūn, *v. n.* }
 Thahrawan, *v. a.* } to stop.

TS.

Tsadun, to call, regular.
 Tsanun, to cast, regular, strike, like
 anun.
 Tsalun, }
 tsalmut. } run away, go away.
 tsajmits. }
 Tsanun, *v. a.* bring in.
 Tsetun, *v. a.* to tear, interrupt, to
 borrow, settle, &c. &c. قطع
 Ts, henun, *v. i.* to be torn.
 Tsissun, to hide, اړاطاع
 Tsokun, *v. (sco.)* be acid.
 Tsapa, silence.
 Tsandar, *s. m.* new moon.
 Tsetas, remembrance, used with
 yun and pyun, to recollect;
 thāwan, to remember.
 Tsor, mtser, *m. f.* more, tsetun, *f.*
 hen sparrow.
 Tsak, *s. f.* anger, used with k, hasun
 and yun.
 Tsep, *verb neu.* hiding from a person.
 Tsai, properly, shade.
 Tsäud, blow.
 Tshawul, } *s. m.* }
 —uj, } *s. f.* } goat.
 Tsér *s. m.* lateness, or *s. f.* apricot.
 Tsór, four.
 Tsuk, acid.
 Tswakyar, acidity.

U.

Uphun, to fly.

V.

Viyinj, *s. f.* fairy.

W.

Wathun, }
 — wuthmut, } to stand up.
 — witsmits, }
 Wasan, }
 — wathmut, } to come
 — wathmats, } down.
 Wuzmal, *s. f.* lightning.
 Wushka, *s. f.* barley.
 Wodinya, }
 or } indeclinable, stand-
 Wotadinya, } ing.
 Wathmn, carpet.
 Wari, *s. m.* inflected }
 Wahras or Warihas. } year.

W.

Wodun, <i>v. n.</i> weep.	Waius, <i>s. f.</i> ages, years (only to a number.)
Wōnun, to weave.	Wazum, <i>adj.</i> loan, agreeing with the substance lent, used with dyun, hyun, or tsatun.
Wōwun, to sow.	Wachh, <i>s. m.</i> breast.
Wudun, to fly.	Wäd, <i>s. f.</i> head (to)
Wushinun, to become warm.	Vyuth, } Vyith, <i>s. f.</i> } fat. Vyechhis, <i>f. p.</i> }
Wyethun, to become fat. (in sco.)	Vyechar, fatness.
Wyethráwan, to fatten.	Wal, <i>m.</i> hair.
Walan, to cover (as with clothes.)	
Wáyun, to plough.	

Y.

Yetsun, <i>v. a. r.</i> wish.	Yer, <i>s. m.</i> wool.
	Yachh, <i>adj.</i> indeclinable, bad, ugly
	Yed, <i>s. f.</i> belly.
	Yél, overcoming.

Z.

Zún, <i>s. f.</i> moon.	Zanún, <i>v. n.</i> to know.
Zú, <i>s. m.</i> life.	Zenun, <i>v. n.</i> to win.
Zúhar, length.	Zyonũ.
Zýuth, <i>m.</i> elder (brother.)	Zenyi.
Zithi or zith, <i>f.</i>	Zethun, <i>v. i. ch.</i> to become, or belong.
Ziche.	Zechhar, length.
Zárpár, excuses.	Zichhar, elderness, being older.
	Zal, <i>s. m.</i> not.
	Zalún, <i>v. a.</i> to burn.
	Zalún, to have a certain disease in the breast? (a cough?)
	Zýun, (probable zu and yun), to be born, to be curdled.
	Zaorun, <i>v. a.</i> to beget, curdle.
	Zaorum, regular.
	Zang, <i>s. f.</i> leg (the whole.)



